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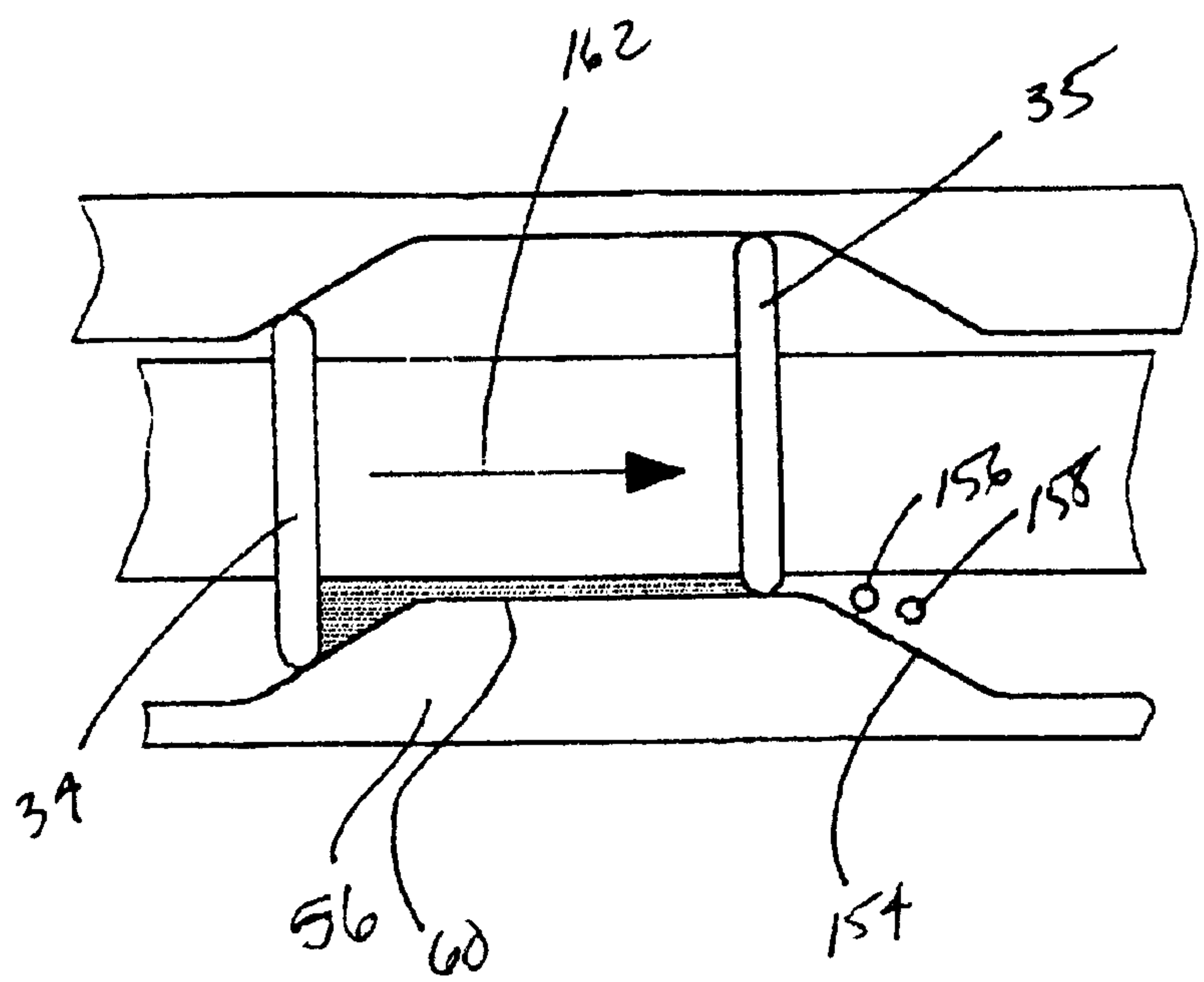

(57) Abrégé/Abstract:
An axial vane rotary engine has a housing with spaced-apart sides and a peripheral wall defining a cylindrical interior chamber. A rotor is rotatably mounted within the interior chamber of the housing. There is an annular cam surface on at least one of the sides of the housing within the interior chamber and axially spaced-apart from the rotor. A plurality of angularly spaced-apart, axially extending slots are formed in the rotor. An axially slidable vane is received in each of the slots. Each vane has an outer portion sealingly engaging the cam surface and forming fluid receiving and pressurizing spaces between adjacent said vanes. The cam surface has a plurality of alternating high cam portions and low cam portions. The high cam portions and the low cam portions are spaced-apart from the rotor and the high cam portions are closer to the rotor than the low cam portions. The vanes extend further from the rotor in the low cam portions compared to the high cam portions so the fluid receiving spaces are compressed when adjacent the high cam portions compared to positions adjacent the low cam portions. There is an air intake means for intaking air into the spaces. A fuel intake means for intaking fuel into the spaces. There is a spark plug for igniting an air/fuel mixture in the spaces and an exhaust for exhausting exhaust gases from the spaces.

ABSTRACT OF THE DISCLOSURE

An axial vane rotary engine has a housing with spaced-apart sides and a peripheral wall defining a cylindrical interior chamber. A rotor is rotatably mounted within the interior chamber of the housing. There is an annular cam surface on at least one of the sides of the housing within the interior chamber and axially spaced-apart from the rotor. A plurality of angularly spaced-apart, axially extending slots are formed in the rotor. An axially slidable vane is received in each of the slots. Each vane has an outer portion sealingly engaging the cam surface and forming fluid receiving and pressurizing spaces between adjacent said vanes. The cam surface has a plurality of alternating high cam portions and low cam portions. The high cam portions and the low cam portions are spaced-apart from the rotor and the high cam portions are closer to the rotor than the low cam portions. The vanes extend further from the rotor in the low cam portions compared to the high cam portions so the fluid receiving spaces are compressed when adjacent the high cam portions compared to positions adjacent the low cam portions. There is an air intake means for intaking air into the spaces. A fuel intake means for intaking fuel into the spaces. There is a spark plug for igniting an air/fuel mixture in the spaces and an exhaust for exhausting exhaust gases from the spaces.

AXIAL VANE ROTARY ENGINE

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to rotary engines having vanes which are axially slidable through the rotor.

Description of Related Art

Many designs of rotary engines have been proposed because they potentially offer significant advantages over conventional piston engines. These include a higher power to weight ratio, reduced vibration and fewer moving parts.

However, only one rotary engine has been mass produced in automobiles and is known as the Wankel engine.

Another type of rotary engine is the axial vane type which is seen, for example, in United States Patent No. 4,401,070 to McCann. Such engines employ a plurality of axially slidable vanes on the rotor which are circumferentially spaced apart. The vanes reciprocate back and forth as the rotor rotates. This action is accomplished by a cam surface on each side of the rotor. When the vanes slide towards the rotor on one side thereof, the space between the rotor and the motor housing decreases, thus compressing gases. In the McCann engine, the gases are compressed in front of each vane in a space between the rotor and the housing. However, the compressed gases must be transferred to a position behind each vane prior to ignition so that the exploding mixture will cause the rotor to rotate. The McCann engine uses passageways in the motor housing and rotor which are aligned at the critical time to permit the compressed charge to be transferred from in front of the rotor to a position behind the rotor.

Other related axial vane rotary devices have been developed as seen, for example, in United States Patent No. 3,819,309 to Jacobs. This patent however discloses a compressor and therefore does not have to cope with the problem of getting compressed gases behind the vanes prior to ignition.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an improved rotary engine which is simpler in construction and gives a higher power to weight ratio than conventional piston engines.

It is another object of the invention to provide an engine with enhanced combustion characteristics.

It is a further objection of the invention to provide an improved rotary engine of the axial vane type which does not require passageways in the rotor to transfer compressed gases from a space in front of the vanes to a space behind the vanes prior to ignition.

In accordance with these objects, the invention provides an axial vane rotary engine having a housing with spaced-apart sides and a peripheral wall defining a cylindrical interior chamber. A rotor is rotatably mounted within the chamber of the housing. There is an annular cam surface on at least one of the sides of the housing within the chamber and axially spaced-apart from the rotor. A plurality of angularly spaced-apart, axially extending slots are formed in the rotor. An axially slidable vane is received in each of the slots. Each vane has an outer portion sealingly engaging the cam surface and forming fluid receiving and pressurizing spaces between adjacent said vanes. The cam surface has a plurality of alternating high cam portions and low cam portions. The high cam portions are closer to the rotor than the low cam portions. The vanes extend further from the rotor in the low cam portions compared to the high cam portions so the fluid receiving and pressurizing spaces are compressed when adjacent the high cam portions compared to positions adjacent the low cam portions. There is air intake means for intaking air into the spaces. Fuel intake means is provided for intaking fuel into the spaces. There is ignition means for igniting an air/fuel mixture in the spaces and exhaust means for exhausting exhaust gases from the spaces.

Preferably ignition takes place between a first vane and a second vane after the first vane has passed a first of the high cam portions and while the second vane is on the high cam portion, thereby exposing a larger area of the first vane to the ignited mixture compared to the second vane to propel the first vane and rotate the rotor.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

Fig. 1 is a diagrammatic side elevation of a rotary engine according to an embodiment of the invention;

Fig. 2 is an unfolded geometrically developed view of a fragment of the housing, rotor and two vanes thereof showing the position upon compression of the mixture;

Fig. 3 is a view similar to Fig. 2 showing the positions of the two vanes upon combustion;

Fig. 4 is an unfolded geometrically developed view of the path of the vanes as they traverse one complete revolution within the engine housing;

Fig. 5 is a diametrical section through the housing and rotor of the engine;

Fig. 6 is a perspective view of one of the cam rings thereof;

Fig. 7 is a side elevation of one of the vanes;

Fig. 8 is a fragmentary top elevation showing the outer portion of one of the vanes engaging the cam surface;

Fig. 9 is a fragmentary top elevation showing the outer portion of one of the vanes engaging the cam surface near a spark plug fuel injector and compression adjuster;

Fig. 10 is a simplified diametrical section of a variation of the invention using one side of the engine as a compressor to serve as a supercharger for the other side of the engine;

Fig. 11 is an unfolded geometrically developed view similar to Fig. 4 of another variation of the invention;

Fig. 12 is a simplified, fragmentary section of the variation of Fig. 12; and

Fig. 13 is a side view of one of the vanes thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to Fig. 1 and 5, a rotary engine 20 which has a housing 22, a rotor 24 rotatably mounted on a shaft 26 and a plurality of vanes 28, 29, 30, 31, 32, 33, 34 and 35.

As seen best in Fig. 5, the housing 22 is in two halves 36 and 38 which are joined together at the center of the engine by a series of bolts 40 extending through flanges 42 and 44 which have an annular seal 46 therebetween. The housing has spaced-apart opposite sides 48 and 50 with annular peripheral wall 52 extending therebetween to define a cylindrical interior chamber 54. The chamber is substantially occupied by the rotor 24.

The sides 48 and 50 of the housing have cam rings 56 and 58. As seen in Fig. 4 and Fig. 6, cam ring 56 has two high cam surfaces 60 and 62 and two low cam surfaces 64 and 66. Similarly, cam ring 58 has high cam surfaces 68 and 70 and low cam surfaces 72 and 74. However, the high cam surfaces of each side are aligned with the low cam surfaces of the other side. For example, high cam surfaces 60 and 62 of cam ring 56 are aligned with low cam surfaces 72 and 74 of cam ring 58.

The rotor 24 has a plurality of angularly spaced-apart, axially extending slots 76 as best shown in Fig. 1. There are eight slots in this example, each one slidably receiving one of the vanes though the number of slots and vanes is not critical. The vanes reciprocate axially as they move about the cam rings during rotation of the rotor. Thus, from the point of view of Fig. 4, vanes 30 and 34 are at their furthest position towards cam ring 58 while travelling over low cam surfaces 72 and 74. At the opposite extreme, vanes 28 and 32 are at the furthest degree of movement towards cam ring 56 while travelling over its low cam surfaces 64 and 66.

Referring to Fig. 7 which shows vane 28, each vane has two portions joined together with a plurality of coil springs 82 in this example. These springs bias the portions 78 and 80 outwardly to remain in sealing contact with the cam rings despite differences in dimensions due to variable cam ring spacing, thermal expansion and the like.

The outer portion of vane 28 is shown in better detail in Fig. 8 which shows this portion of the vane in contact with cam ring 56. The other vanes are similar. There is a side seal 84 at each outer tip of the vane. The side seal has a protrusion 86 which slidably fits within slot 88 in main body 90 of the vane. A coil spring 91 located at the inner end of the slot biases the side seal 84 outwardly against the cam ring 56. Roller 94 is rotatably mounted on the outer end of the side seal by an axle 96. Seals 98 and 100 are located in slots 99 and 101 on the outer tip of each seal. The seals are biased outwardly by springs 102 and 104. The seals contact the cam surface 56 to ensure sealing at the tip of the vane. The rollers 94 engages the cam ring 56. The rotor 24 has slots 106 which slidingly receive seals 108 which are biased against the side seals 84 of the vanes by springs 110. There is a total of eight such seals 108 per vane. Another such seal (not shown) on the side opposite seal 108 and two more on the perpendicular sides. This is duplicated on the opposite end of each vane.

Shaft 26 of the rotor is rotatably mounted in the housing 22 by means of bearings 112 and 114 shown best in Fig. 5. The cam rings are secured to the sides 48 and 50 of the housing by means of a plurality of bolts 116, only one of which is shown in Fig. 5.

Seals 120 and 122 extend about the shaft 26 between the shaft and the housing. Seals 124 and 126 are located between rotor 24 and the housing adjacent the shaft 26. The outer portion of the rotor is provided with seals 128, 130, 132 and 134 between the rotor and the housing.

There is an intake port 140 shown in Fig. 1 and 4 which is in the form of three apertures, 141, 142 and 143 in cam ring 56 as seen best in Fig. 6. This is connected to an air intake, typically equipped with an air cleaner (not shown). In this particular example, a lean fuel mixture is also taken in through air intake 140 with the air. This can be supplied from a carburetor or external fuel injector. There is a similar intake port for the other side of the engine. The intake port is located at the beginning of sloped transition portion 145 of the cam ring which connects high cam surface 62 with low cam surface 64 as seen in Fig. 4. As vane 35 moves in the direction of rotation indicated by arrow 144 at the top of Fig. 4, the vane moves to the left from the point of view of this drawing, increasing the volume of space 146 between vane 35 and vane 34 as best shown where vane 35 is repeated near the bottom of Fig. 4. As vane 35 moves forwardly to the position of vane 28, it may be seen that space 146 expands to the volume of space 148 shown between vanes 28 and 35. This expansion of space 146 draws the air and lean fuel mixture into the space 146 through the port 140.

Once vane 34 is in the position of vane 35 at the top of Fig. 4, the space 146 is sealed. Compression of the air and lean fuel mixture begins and vane 35 moves to the position of vane 29. The mixture is further compressed as vane 35 reaches the position shown in Fig. 4 for vane 30. It may be readily seen that space 150 is significantly smaller than spaces 148 or 152. The maximum compression of the mixture occurs as vane 34 approaches the beginning of high cam portion 60 as seen in Fig. 2. Vane 35 then moves just past the high cam portion 60 on transition portion 154 as seen in Fig. 3. The vane 35 is then past spark plug 156 and fuel injector 158. In this embodiment the spark plug 156 is mounted on an auxiliary combustion chamber 160, shown only in Fig. 1, which communicates with the space 157 between the cam ring and the rotor.

It may be seen with reference to Fig. 3 that at this point a considerably longer portion of vane 35 is exposed to the mixture in space 146 compared with vane 34. Consequently once ignition occurs, the pressure of the explosion creates a much greater force on vane 35 compared to vane 34 so that the net result is to propel vane 35 forwardly in the direction of arrow 162 and thereby rotate the rotor 24 in the desired direction of rotation. Forward directions herein are defined as being in the direction of rotation of the rotor illustrated by arrow 162 while rearward directions are opposite the arrow.

It will be noted, however, that unlike some prior art engines and rotary devices of this type, the high cam surface 60 is spaced-apart from the rotor to allow the compressed mixture to pass by the high cam portion to enter the area adjacent the fuel injector and spark plug as shown in Fig. 3. However, the space 146 is sealed rearwardly as vane 34 contacts the high cam surface 60. This configuration avoids the need for passageways in the rotor and temporary storage locations for compressed gases as found in some prior art devices.

Additional fuel is added through fuel injector 158 just prior to ignition. A spark is then provided by spark plug 156 and, as discussed above, the explosion drives vane 35 forwards through the positions of vanes 32 and 33 shown near the center of Fig. 4. Once vane 34 reaches the position of vane 31 in Fig. 4, the space 146 between vanes 34 and 35 is no longer in communication with the spark plug 156. However, there is a groove 164 in peripheral wall 54 of the housing, shown only in broken lines in Fig. 1, which extends from the position of the spark plug 156 to a position 166 which is just behind vane 35 in Fig. 1. In this way, hot ignited gases are able to communicate with space 146 between vanes 34 and 35 and space 148 between vanes 35 and 28. The duration and completeness of combustion is thereby desirably extended.

There is an exhaust port 172 located on transition portion 176 in front of low cam surface 66 and behind high cam portion 62. The port comprises three apertures 171, 173 and 175 as seen in Fig. 6. However, the number or shape of the apertures is not critical. As the vane 35 approaches the port as shown for vane 33 in Fig. 4, the gases are compressed and driven out through the engine through the exhaust port. Thus the engine operates through four cycles on each side during a single rotation of the rotor. However, configurations could be devised whereby the engine operates through two or more sets of four cycles during a single rotation.

As seen in Fig. 6 for cam ring 56, the intake port 140 and exhaust port 172 are actually on opposite sides of high cam portion 62. A spring loaded seal 177 on the ring seals the ports from each other.

VARIATIONS AND ALTERNATIVES

A variation of the invention is shown in Fig. 9 where vane 35.1 is shown approaching fuel injector 158.1 and spark plug 156.1. In this case there is a compression adjustor 180 in the form of a threaded member extending through the housing 22 to the combustion chamber formed adjacent the fuel injector and spark plug. The compression can be increased by screwing adjuster 180 inwardly towards the vane or reduced by rotating in the opposite direction. This allows the compression to be adjusted for different fuels.

While the engine 20 is shown with eight vanes, it should be understood that other configurations may use a greater number or fewer number of vanes. In addition, while both sides of engine 20 are configured as engines, the device would work with only one side operating as a engine. In such a case, the vanes could be biased towards the cam surface by springs, fluid pressure or the like rather than passing completely through the rotor to a cam surface on the other side. Alternatively, the engine could be two-sided, but one side could act as a compressor to supercharge to other side of the engine.

Fig. 10 shows an alternative engine 20.2 equipped with vanes 182 and 184 which have smaller outer portions 186 and 188 on one side compared to outer portions 190 and 192 on the other side. In this case, side 194 is configured as an engine, while side 196 is configured as a compressor. The air compressed on side 196 enters one or more burners 198, each of which is equipped with a fuel injector 200 and a spark plug 202. In this case, the combustion of the air/fuel mixture is external to the housing of the engine and enters the engine at ports (not shown) adjacent the position just past the high cam surface where the space between vanes begins to expand as the rotor rotates. Such a configuration can have four power impulses per revolution with four vanes.

Fig. 11 - 13 show a rotary engine 20.3 according to another variation.

Referring first to Fig. 11, this engine has six vanes 28.3, 29.3, 30.3, 31.3 and 32.3, rather than the eight vanes used on the embodiment of Fig. 1 - 5. Only a single cam ring 56.3 is illustrated in Fig. 11, but there is a similar cam ring on the opposite side of rotor 24.3 similar to the embodiment to Fig. 4. The cam ring 56.3 has two high cam surfaces 60.3 and 62.3 and two low cam surfaces 64.3 and 66.3. These are arranged so that the high cam surfaces are opposite the low cam surfaces of the other cam ring and so that the low cam surfaces are opposite the high cam surfaces of the other cam ring. Thus, by choosing the vane length and width to suit, the rotor can turn with the vanes sealed against the cam ring, thus providing positive displacement. The illustrated engine is a four-stroke engine having twelve difligrations per revolution. Intake ports, consisting of a series of holes through the walls of the housing, are provided in the area shown generally at 250 in Fig. 11. Port timing may be controlled by covering and uncovering these ports using a servo mechanism controlled by engine speed.

The main distinctions between the embodiment of Fig. 11 - 13 and the previous embodiments include the shape of the vanes and the configuration of the rotor. As seen best in Fig. 13 for vane 28.3, each vane has rounded ends 252 and 254 instead of being square. This rounded shape, circular segments in this embodiment, facilitates the configuration of seals used on the ends of the vanes. Thus, a single U-shaped seal may be used instead of one of the straight seals 98 or 100 as shown in Fig. 8 as well as the two straight seals perpendicular thereto as required for the previous embodiment.

In addition, because of the shape of the vanes, the cam rings have concave ends as seen for cam ring 56.3 in Fig. 12. In this embodiment the cam rings are formed by continuous annular troughs in each half of the housing, such as trough 256 in housing half 36.3 shown in Fig. 12. There is also a semi-toroidal protrusion 258 on each side of the rotor within the trough. The depth of the trough varies, forming the high and low cam surfaces discussed above. Fig. 12 shows the depth of the trough adjacent low cam surface 64.3. At the high cam surfaces 60.3 and 62.3, the trough is near the protrusion 258.

A likely limit to the rotational speed of the engine is determined by the force experienced by the vanes as they accelerate while rotating. Referring to Fig. 11, the high cam surfaces 60.3 and 62.3 along with low cam surfaces 64.3 and 66.3 are parallel to the sides of the rotor and are referred to as "dwells". The transition portions 154.3 between the high and low cam portions are referred to as "ramps". The constraint discussed above requires that the ramps offer the lowest possible acceleration, which suggests that the dwells should be as small as possible, thus allowing the largest number of degrees of rotation for vane acceleration on the ramps. In this embodiment, the ramps are 67.5° and the dwells 22.5° in angular displacement. The inner radius of the trough in this embodiment is four inches, while the outer radius is six inches. This gives the vanes a stroke of two inches. The ramps are cycloidal and the vanes have a tip radius of over two inches. The shape of the cycloidal ramps is modified and the vane tip radius changes over the width of the trough so that the vanes can pass between the two cycloids and maintain straight lines of contact with the ends of the troughs. Minimum vane thickness is calculated on the basis that the vane must not shear at the point of exit from the slot in the rotor. The vane thickness of this engine is about 0.75 inches for a spark ignition version.

The shape of the combustion chamber at minimum displacement, that is adjacent the high cam surfaces, must be configured to allow for flame propagation and not to provide restrictions to flow due to pressure gradients. This can be accomplished by removing material from the half-toroid on the rotor in between each pair of vanes in such a way that the cross-sectional area of the chamber normal to the tangential direction is approximately constant over the distance between the vanes. The spark plug is situated behind the leading vane towards the end of the compression stroke. The fresh charge is therefore swept towards the flame front by the following vane, thus reducing the time, or shaft angle, for completion of combustion.

It will be understood by someone skilled in the art that many of the details provided above are by way of example only and are not intended to limit the scope of the invention which is to be interpreted with reference to the following claims.

WHAT IS CLAIMED IS:

1. An axial vane rotary engine, comprising:

a housing having spaced-apart sides and a peripheral wall defining a cylindrical interior chamber;

a rotor rotatably mounted within the interior chamber of the housing;

an annular cam surface on at least one of the sides of the housing within the interior chamber and axially spaced-apart from the rotor;

a plurality of angularly spaced-apart, axially extending slots in the rotor;

an axially slidable vane received in each of the slots, each vane having an outer portion sealingly engaging the annular surface and forming fluid receiving and pressurizing spaces between adjacent said vanes;

air intake means for intaking air into the spaces;

fuel intake means for intaking fuel into the spaces;

ignition means for igniting an air/fuel mixture in the spaces, the fuel intake means including a fuel injector adjacent the ignition means;

exhaust means for exhausting exhaust gases from the spaces; and

the cam surface having a plurality of alternating high cam portions and low cam portions, which are both spaced-apart from the rotor, the high cam portions being closer to the rotor than the low cam portions, so the vanes extend further from the rotor when adjacent the low cam portions compared to the high cam portions and the fluid receiving spaces are compressed when adjacent the high cam portions compared to positions adjacent the low cam portions.

2. An axial vane rotary engine, comprising:

a housing having spaced-apart sides and a peripheral wall defining a cylindrical interior chamber;

a rotor rotatably mounted within the interior chamber of the housing;

an annular cam surface on at least one of the sides of the housing within the interior chamber and axially spaced-apart from the rotor;

a plurality of angularly spaced-apart, axially extending slots in the rotor;

an axially slidable vane received in each of the slots, each vane having an outer portion sealingly engaging the annular surface and forming fluid receiving and pressurizing spaces between adjacent said vanes;

air intake means for intaking air into the spaces;

fuel intake means for intaking fuel into the spaces;

ignition means for igniting an air/fuel mixture in the spaces;

exhaust means for exhausting exhaust gases from the spaces; and the cam surface having a plurality of alternating high cam portions and low cam portions, which are both spaced-apart from the rotor, the high cam portions being closer to the rotor than the low cam portions, so the vanes extend further from the rotor when adjacent the low cam portions compared to the high cam portions and the fluid receiving spaces are compressed when adjacent the high cam portions compared to positions adjacent the low cam portions, and wherein the portions of the cam surface each have forward and rearward ends, the vanes moving from the rearward ends to the forward ends of the portions as the rotor rotates, the ignition means being forward of the forward end of a first high cam portion and being timed to ignite the air/fuel mixture when each vane has rotated past the ignition means, a first low cam portion being next to the first high cam portion in the direction opposite the direction of rotation of the rotor, the air intake means being rearwards of the rearward end of the first low cam portion.

3. An engine as claimed in claim 2, wherein a second low cam portion is on a side of the first high cam portion opposite the first low cam portion, the exhaust means being forwards of the second low cam portion in the direction of rotation of the rotor.

4. An engine as claimed in claim 1, wherein a forward vane of said adjacent vanes has a greater area exposed to the fluid receiving spaces compared to a rearward vane thereof when the ignition means ignites the air/fuel mixture, to rotate the rotor in a specified direction of rotation.

5. An axial vane rotary engine, comprising:

a housing having spaced-apart sides and a peripheral wall defining a cylindrical interior chamber;

a rotor rotatably mounted within the interior chamber of the housing;

an annular cam surface on at least one of the sides of the housing within the interior chamber and axially spaced-apart from the rotor;

a plurality of angularly spaced-apart, axially extending slots in the rotor;

an axially slidable vane received in each of the slots, each vane having an outer portion sealingly engaging the annular surface and forming fluid receiving and pressurizing spaces between adjacent said vanes;

air intake means for intaking air into the spaces;

fuel intake means for intaking fuel into the spaces;

ignition means for igniting an air/fuel mixture in the spaces;

exhaust means for exhausting exhaust gases from the spaces; and

the cam surface having a plurality of alternating high cam portions and low cam portions, which are both spaced-apart from the rotor, the high cam portions being closer to the rotor than the low cam portions, so the vanes extend further from the rotor when adjacent the low cam portions compared to the high cam portions and the fluid receiving spaces are compressed when adjacent the high cam portions compared to positions adjacent the low cam portions, the portions of the cam surface each having forward and rearward ends, the vanes moving from the rearward ends to the forward ends of the portions as the rotor rotates, the ignition means being forward of the forward end of a first high cam portion and being timed to ignite the air/fuel mixture when each vane has rotated past the ignition means, and wherein a first low cam portion is next to the first high cam portion in the direction opposite the direction of rotation of the rotor, the air intake means being rearwards of the rearward end of the first low cam portion, a second cam portion being on the exhaust means and being forwards of the second low cam portion in the direction of rotation of the rotor.

6. An axial vane rotary device, comprising:

a housing having spaced-apart sides and a peripheral wall defining a cylindrical interior chamber;

a rotor rotatably mounted within the interior chamber of the housing;

an annular cam surface on at least one of the sides of the housing within the interior chamber and axially spaced-apart from the rotor;

a plurality of angularly spaced-apart, axially extending slots in the rotor;

an axially slidable vane received in each of the slots, each vane having an outer portion sealingly engaging the annular surface and forming fluid receiving and pressurizing spaces between adjacent said vanes;

air intake means for intaking air into the spaces;

fuel intake means for intaking fuel into the spaces;

ignition means for igniting an air/fuel mixture in the spaces;

exhaust means for exhausting exhaust gases from the spaces; and the cam surface having a plurality of alternating high cam portions and low cam portions, which are both spaced-apart from the rotor, the high cam portions being closer to the rotor than the low cam portions, so the vanes extend further from the rotor when adjacent the low cam portions compared to the high cam portions and the fluid receiving spaces are compressed when adjacent the high cam portions compared to positions adjacent the low cam portions, one side of the rotary device being configured as an engine, another side of the device being configured as a compressor and being coupled as a supercharger for said one side.

7. A device as claimed in claim 6, wherein there is an external combustion chamber between the sides of the device.

8. An engine as claimed in claim 1, having transition portions on the cam surface which are angled with respect to the high and low cam surfaces.

9. An engine as claimed in claim 1, wherein the cam surface is concavely curved in profile and the outer portion of each said vane is convexly curved to conform to the cam surface.

10. An axial vane rotary device, comprising:

a housing having spaced-apart sides and a peripheral wall defining a cylindrical interior chamber;

a rotor rotatably mounted within the interior chamber of the housing;

an annular cam surface on at least one of the sides of the housing within the interior chamber and axially spaced-apart from the rotor;

a plurality of angularly spaced-apart, axially extending slots in the rotor;

an axially slidable vane received in each of the slots, each vane having an outer portion sealingly engaging the annular surface and forming fluid receiving and pressurizing spaces between adjacent said vanes;

air intake means for intaking air into the spaces;

fuel intake means for intaking fuel into the spaces;

ignition means for igniting an air/fuel mixture in the spaces;

exhaust means for exhausting exhaust gases from the spaces; and

the cam surface having a plurality of alternating high cam portions and low cam portions, which are both spaced-apart from the rotor, the high cam portions being closer to the rotor than the low cam portions, so the vanes extend further from the rotor when adjacent the low cam portions compared to the high cam portions and the fluid receiving spaces are compressed when adjacent the high cam portions compared to positions adjacent the low cam portions, the rotor having a semi-toroidal protrusion extending toward the cam surface.

11. An engine as claimed in claim 10, wherein the cam surface profile and the outer portion of each vane are circular segments in shape.

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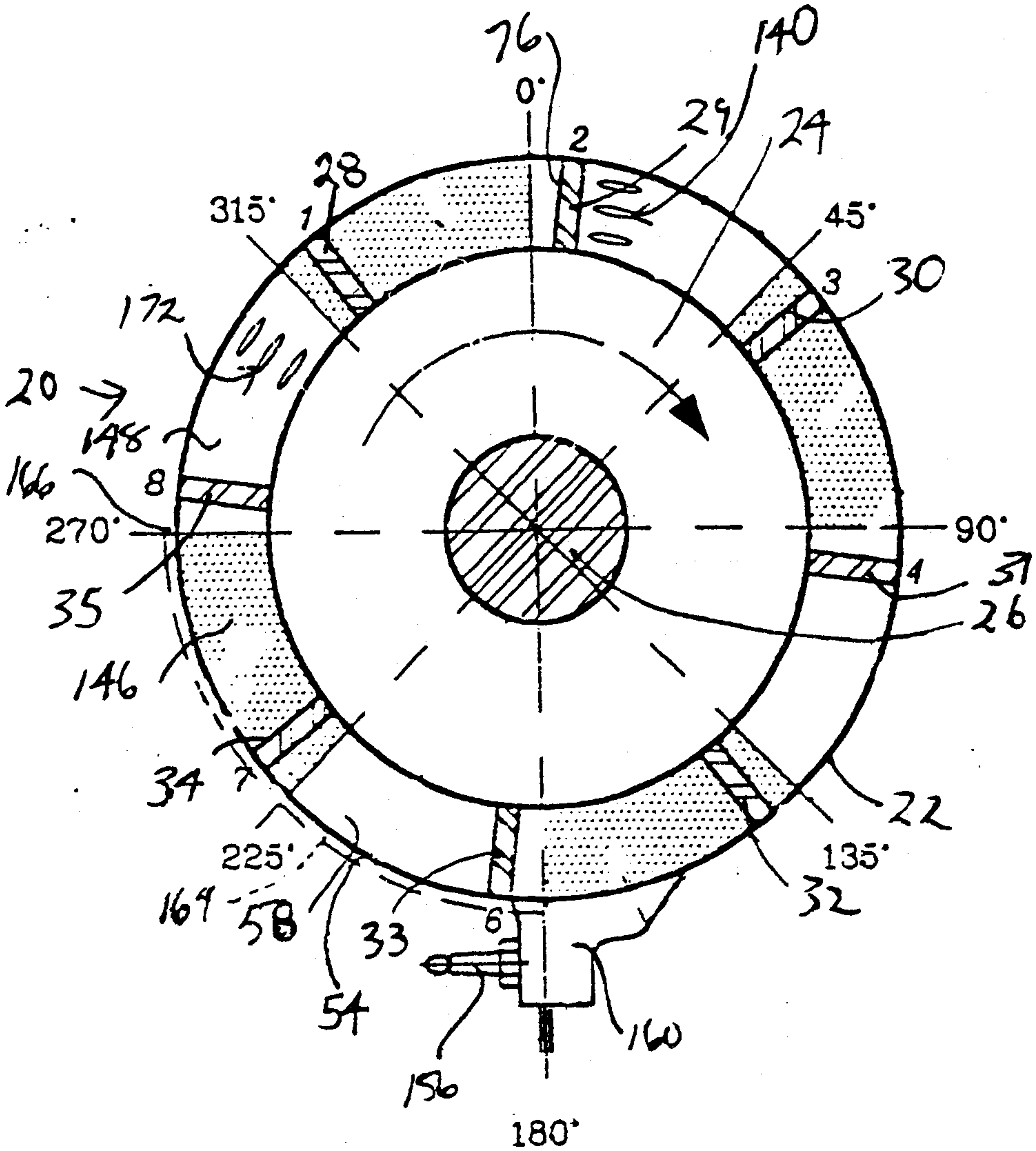


Fig 1

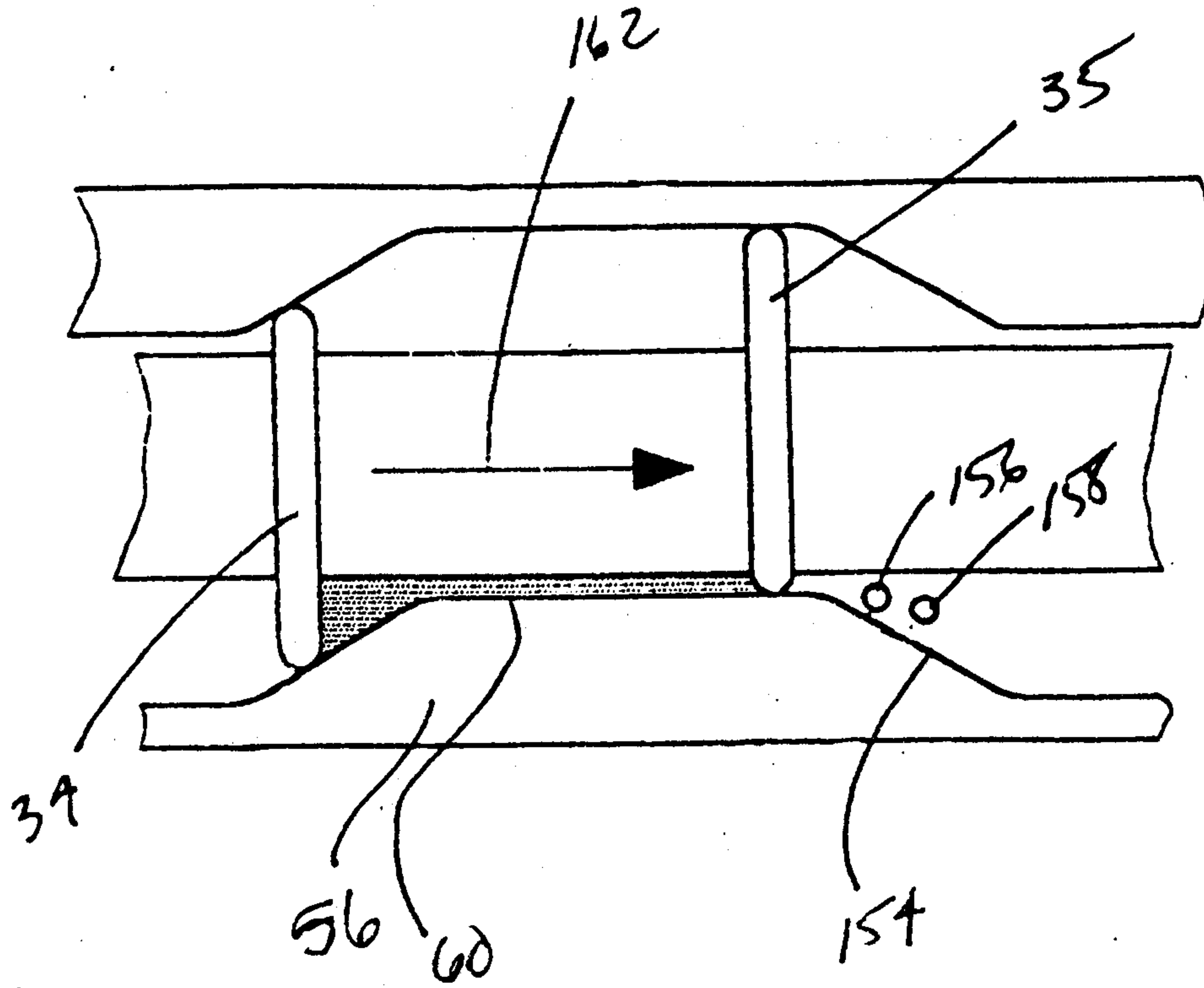


Fig 2

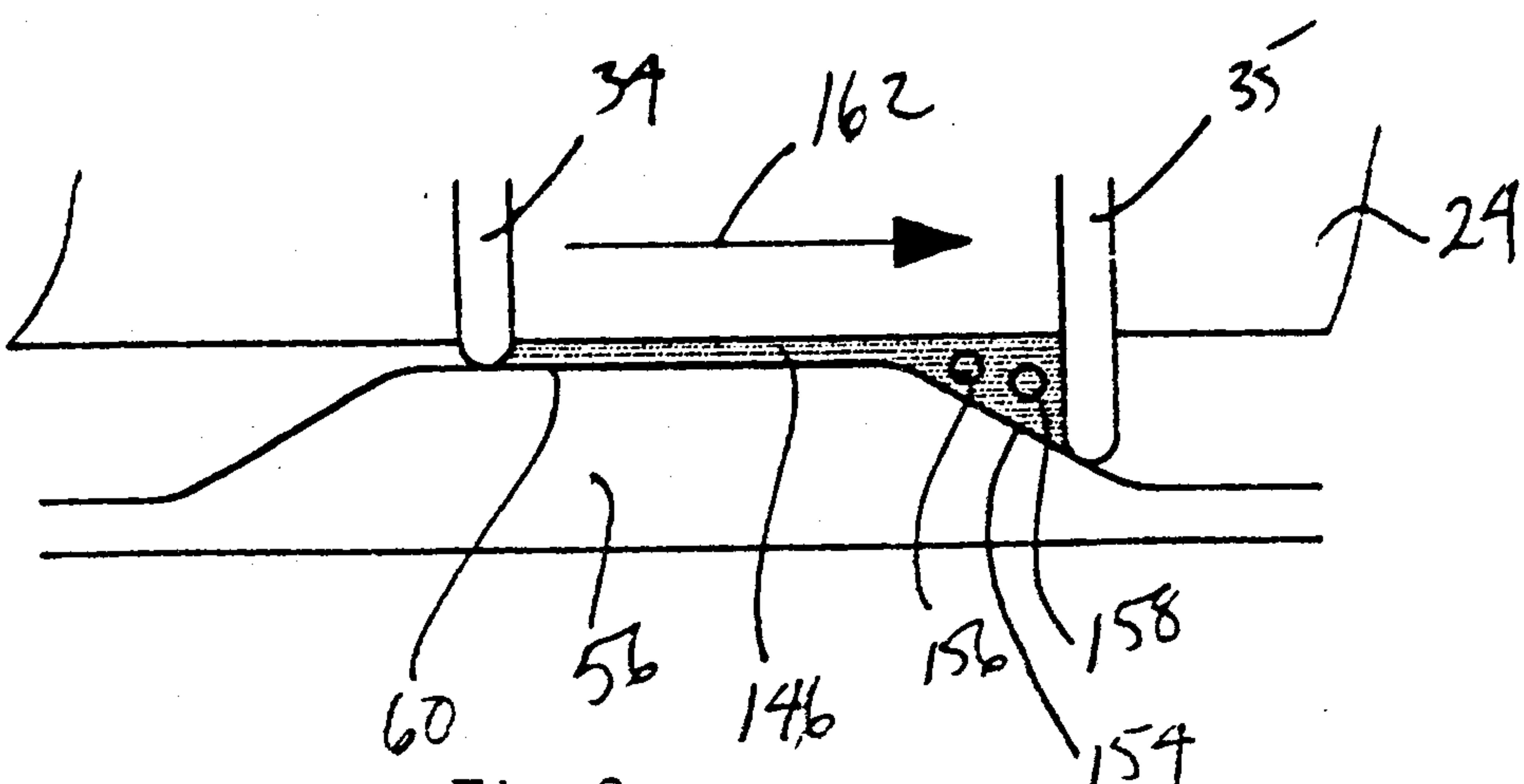
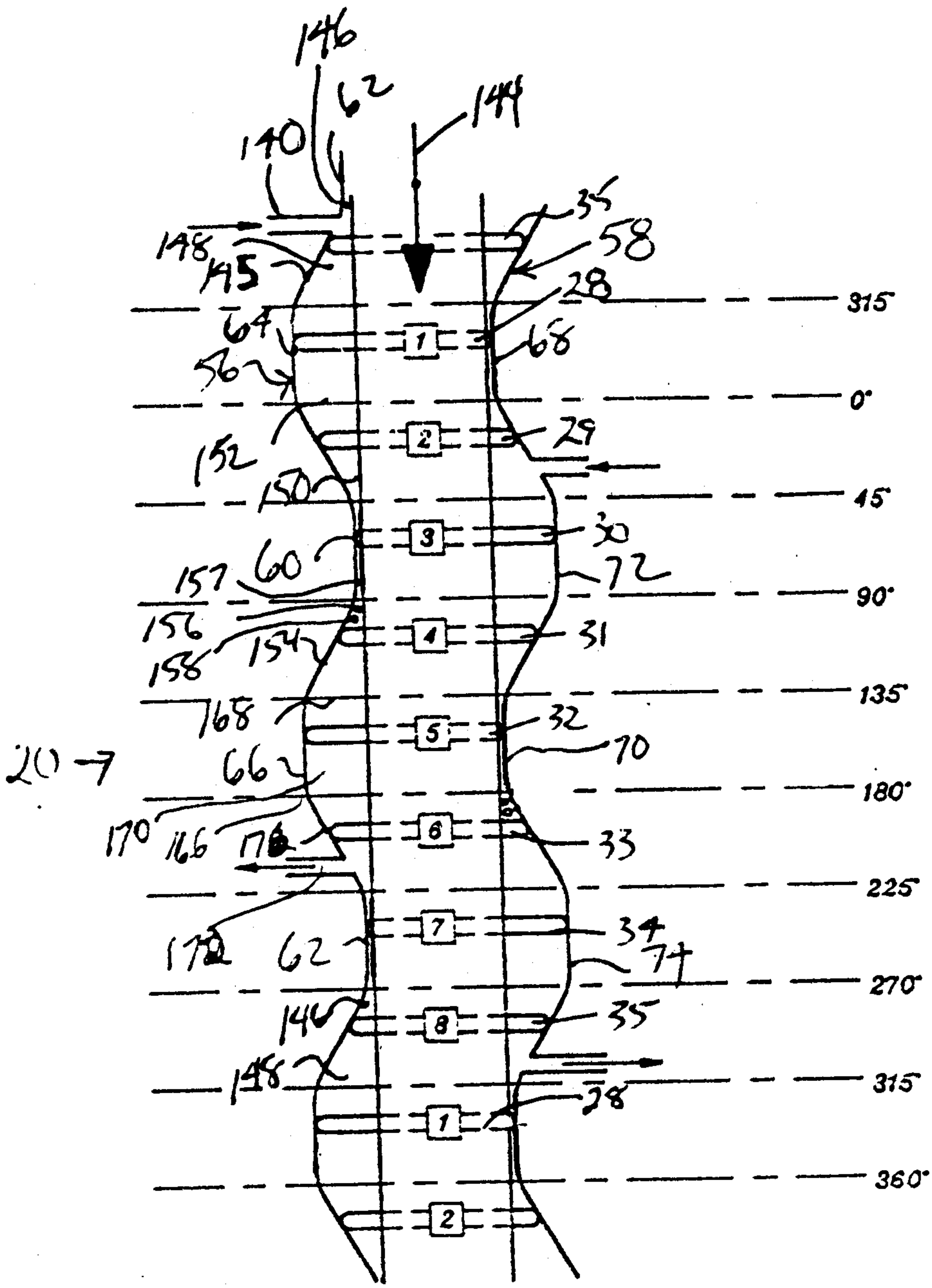


Fig 3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70
20
66
180°
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166
176
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225°
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74
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Fig 4

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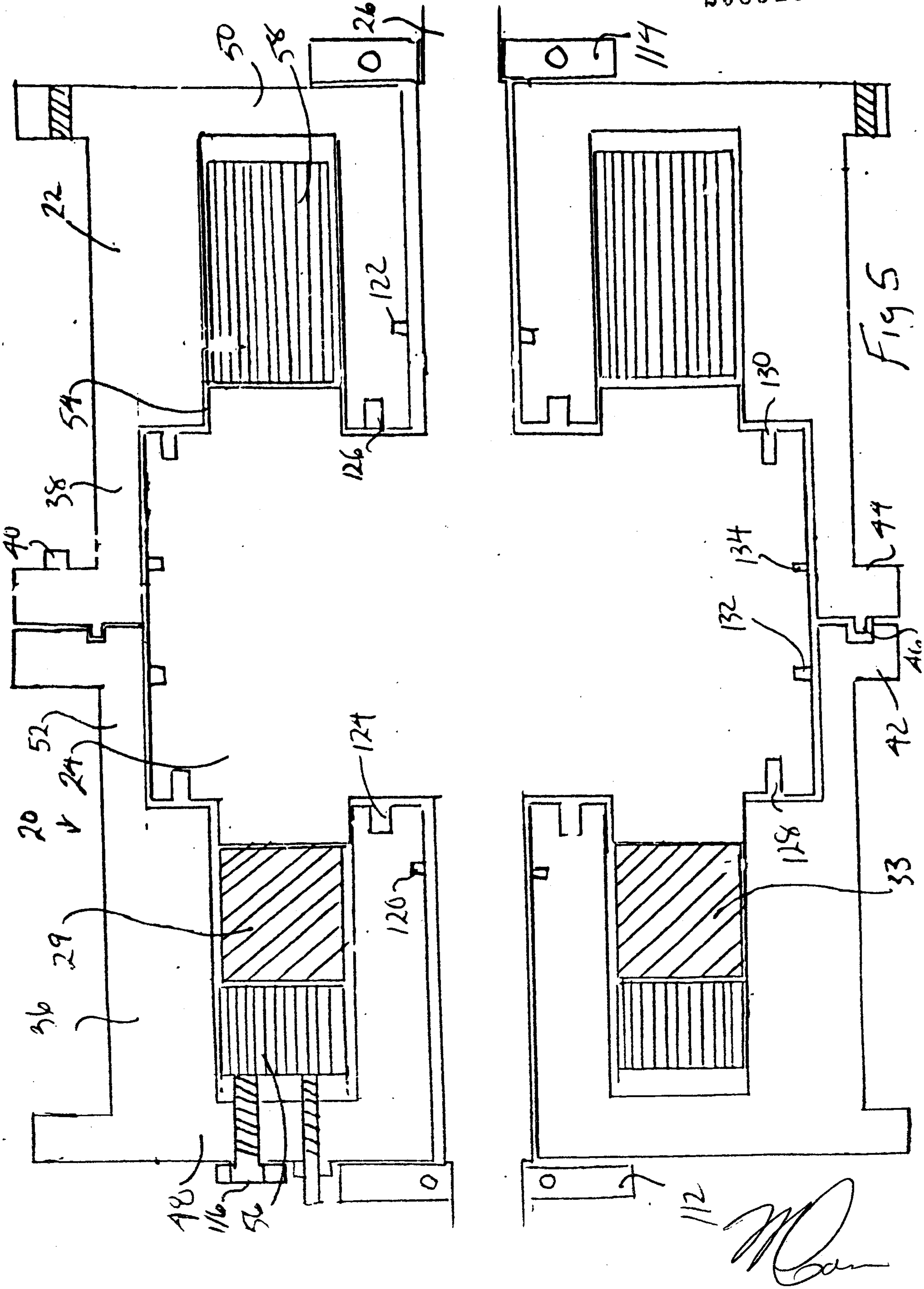

Fig 5

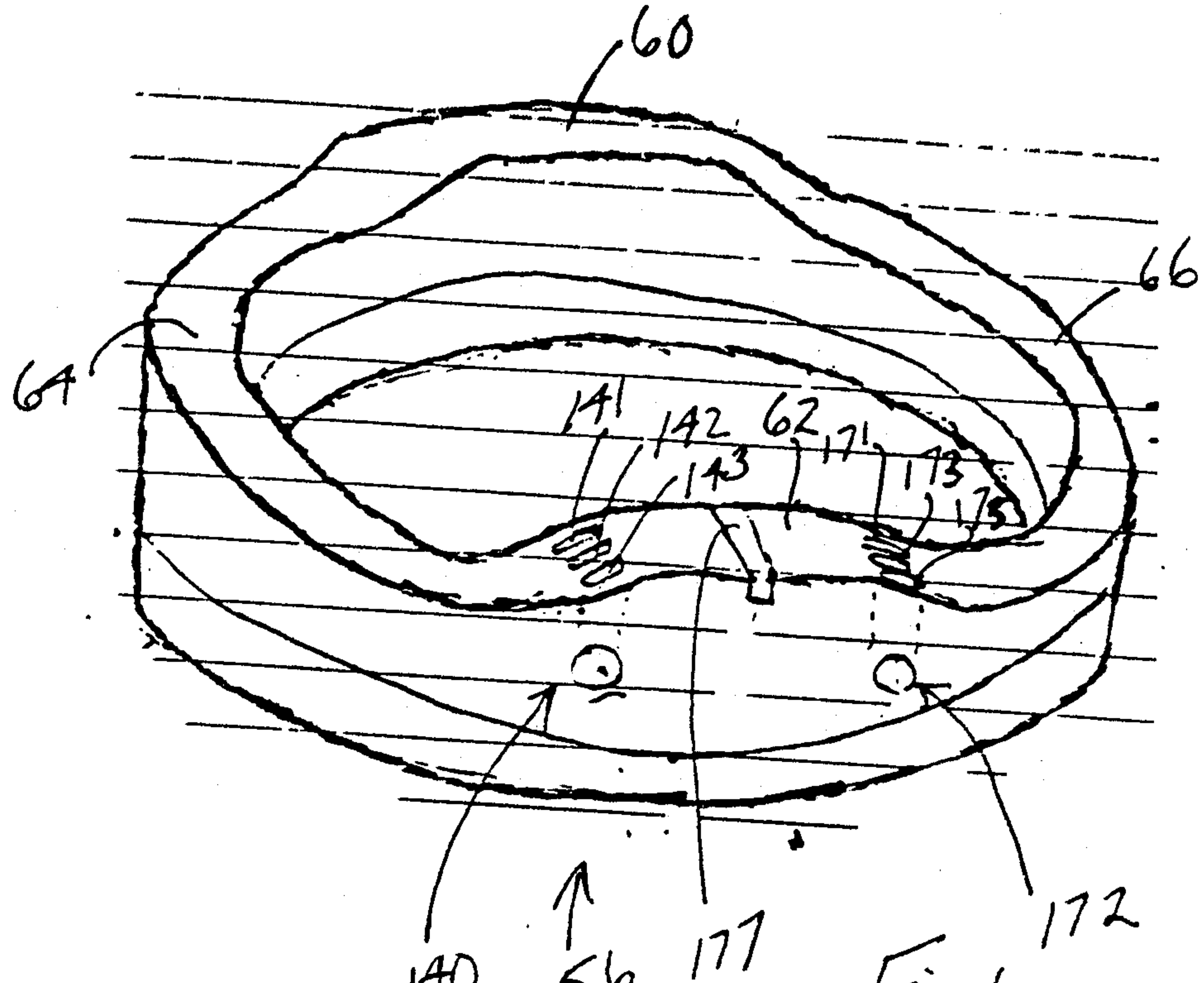

Fig. 6

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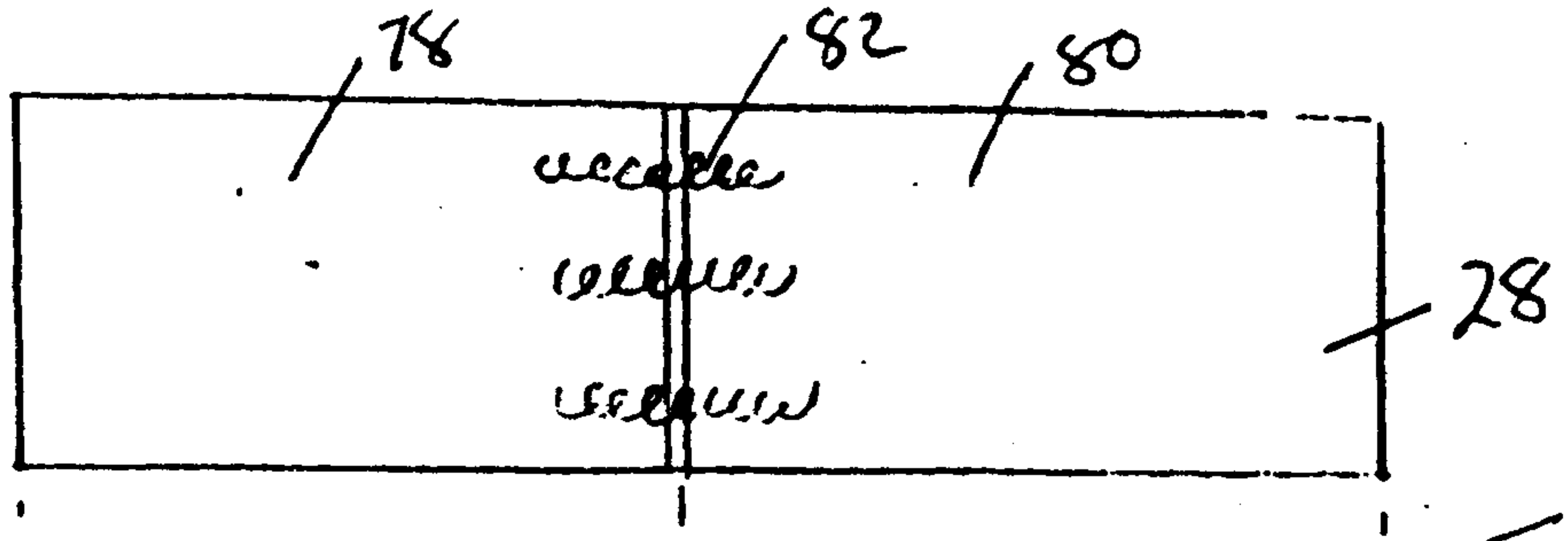
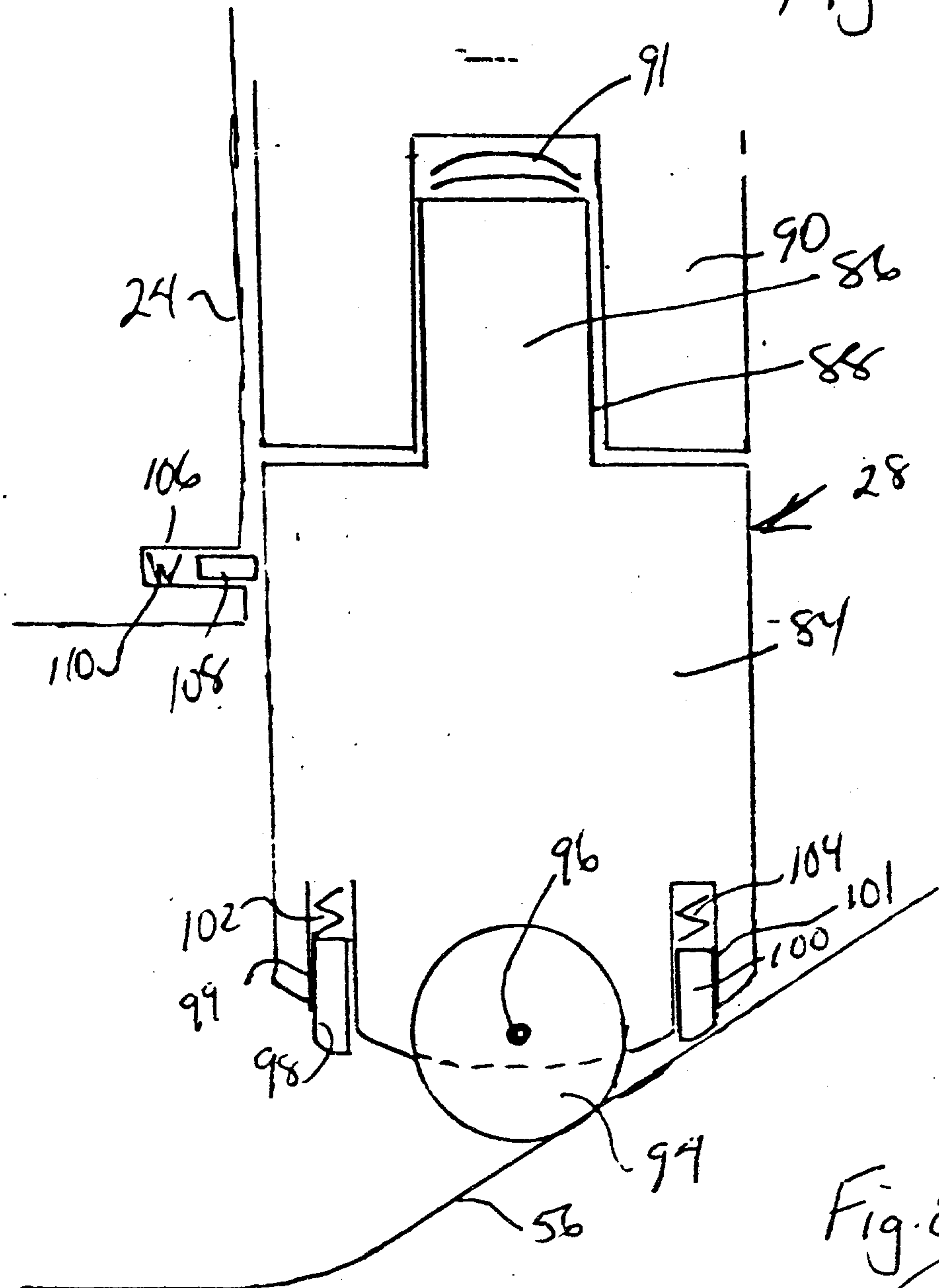


Fig. 7



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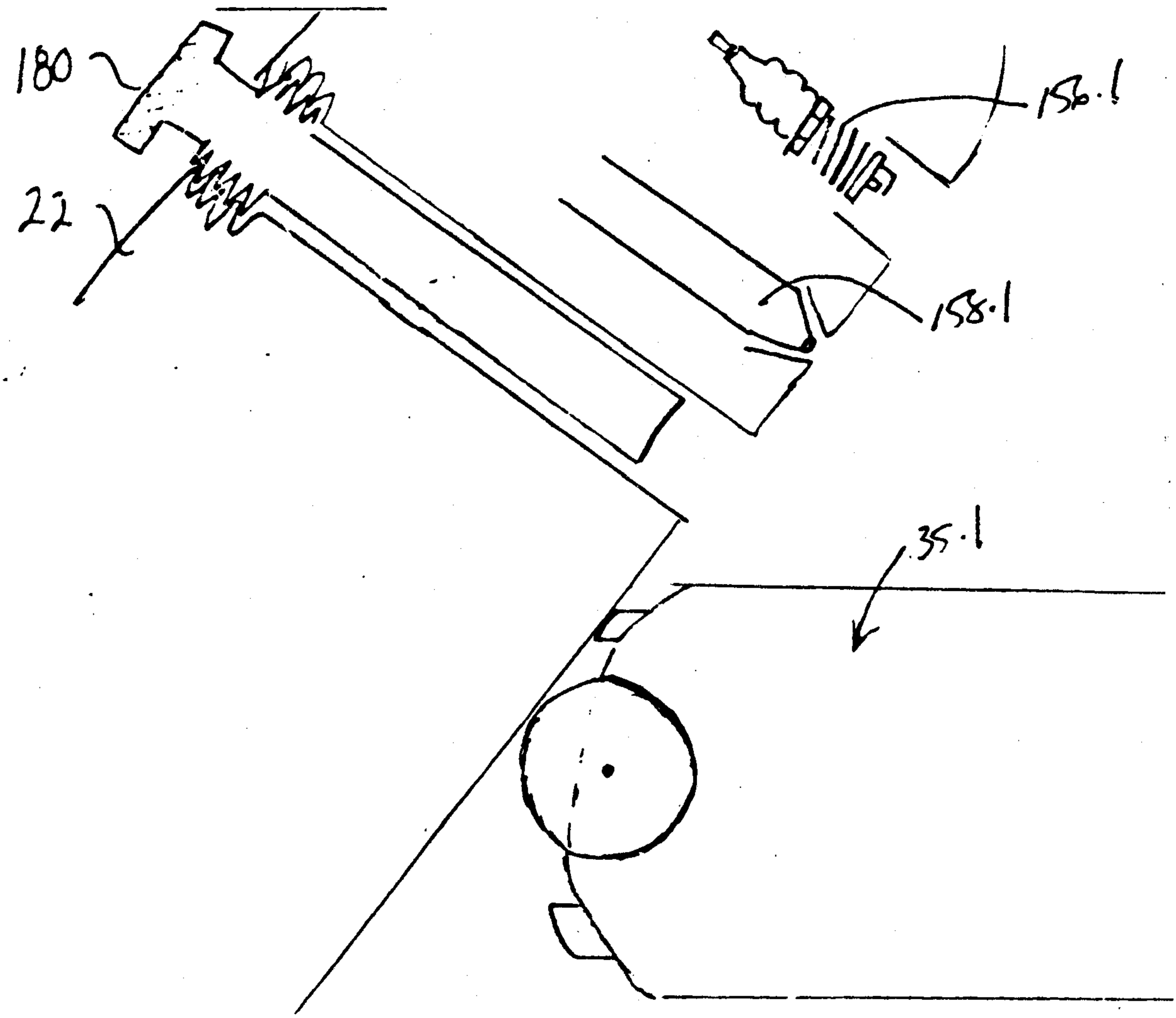

Fig.9

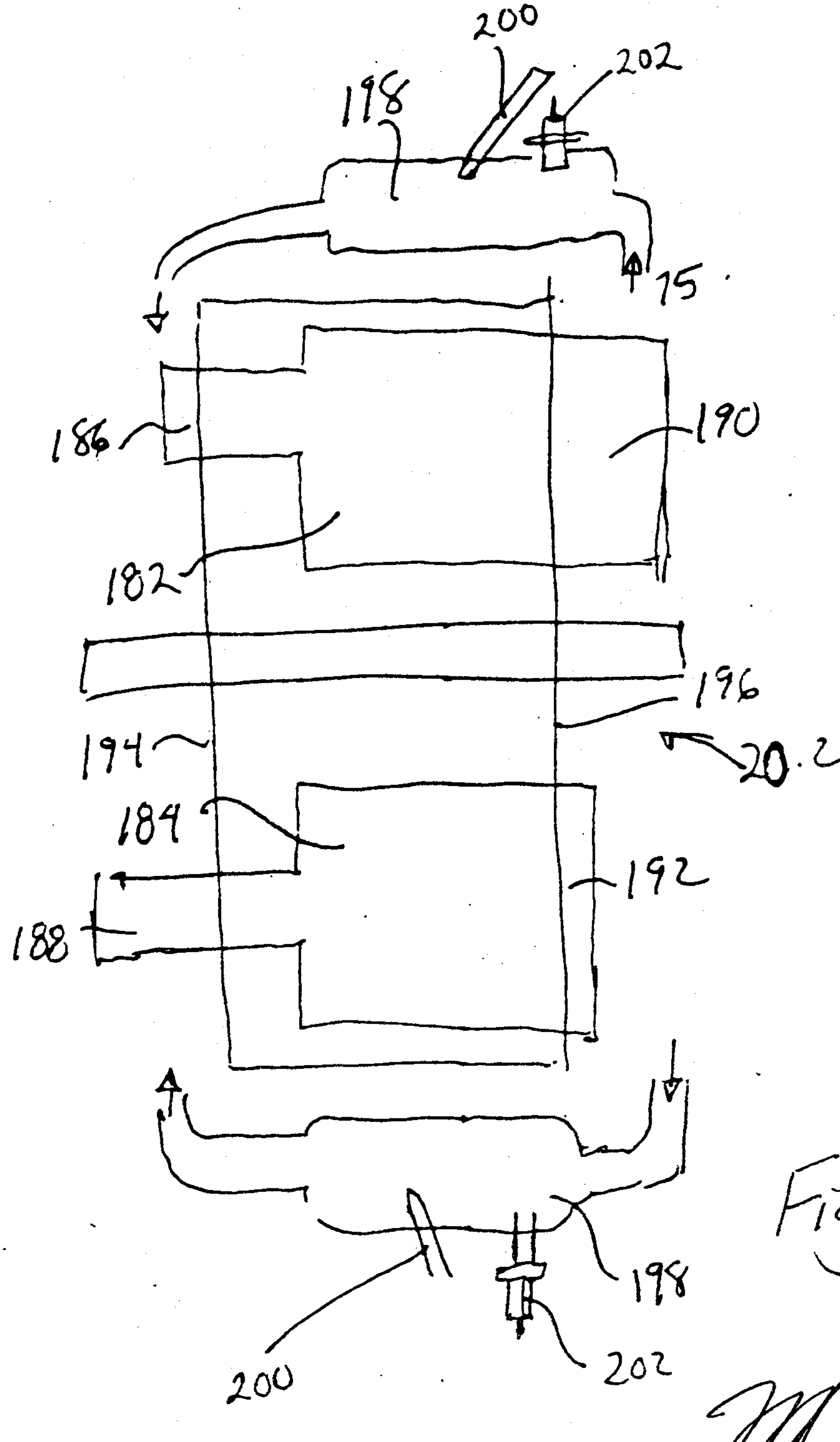

Fig. 10

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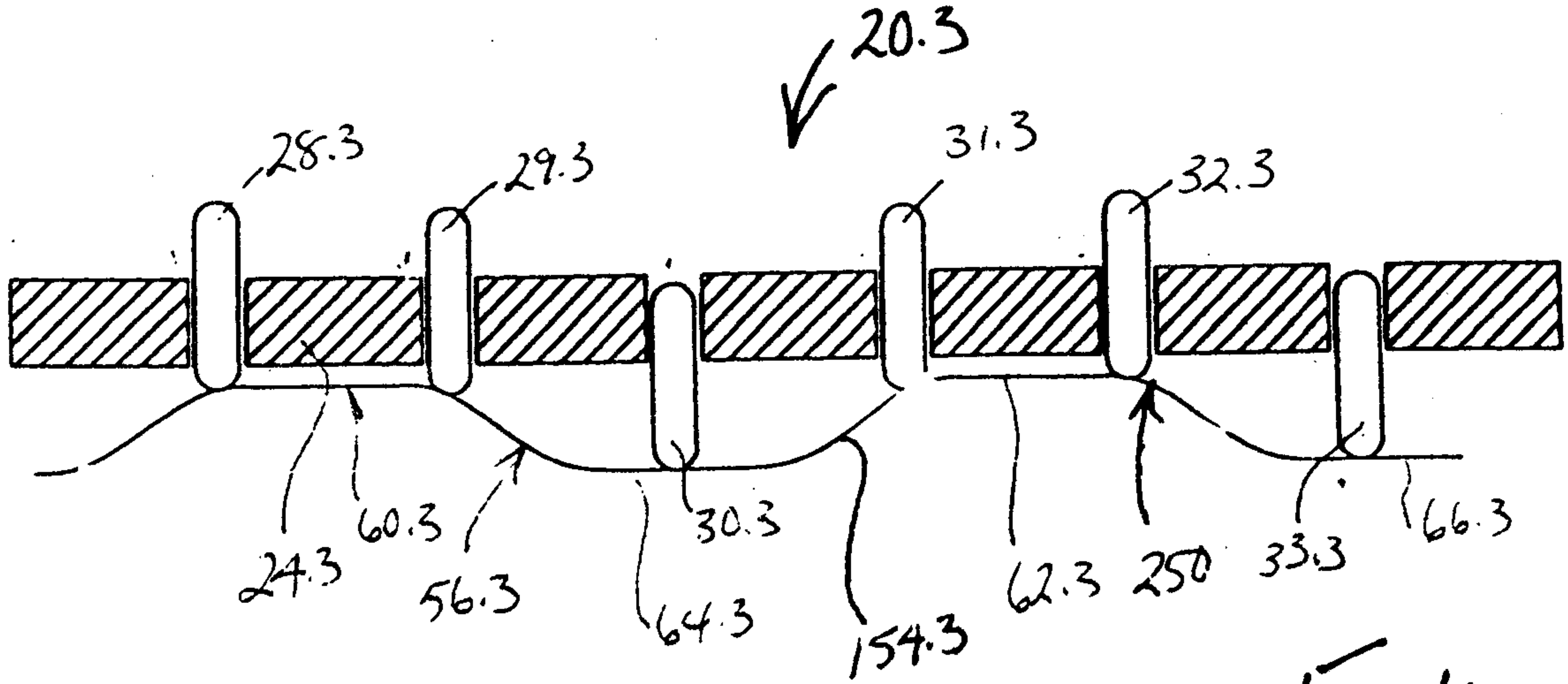

Fig. 11

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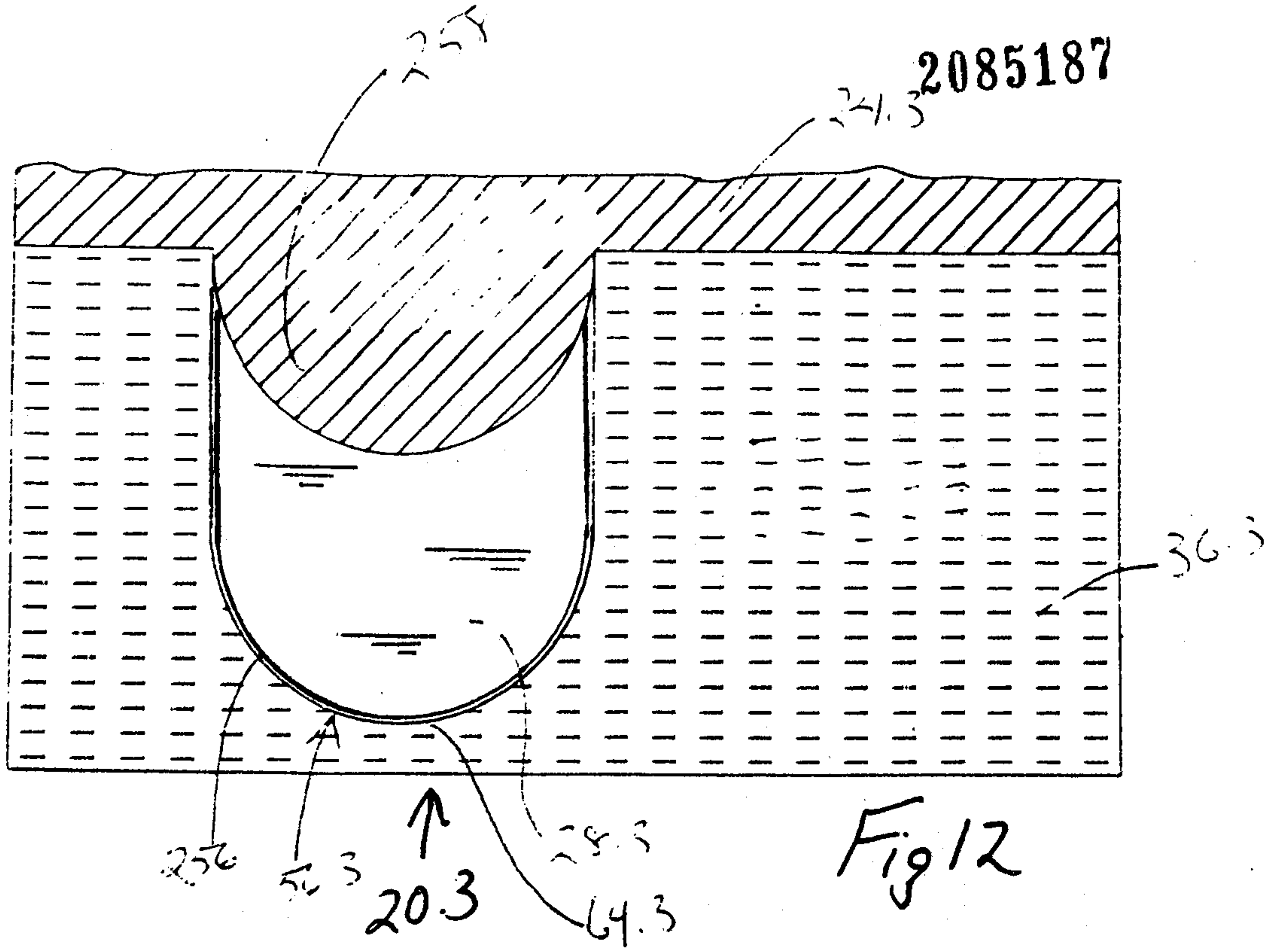


Fig 12

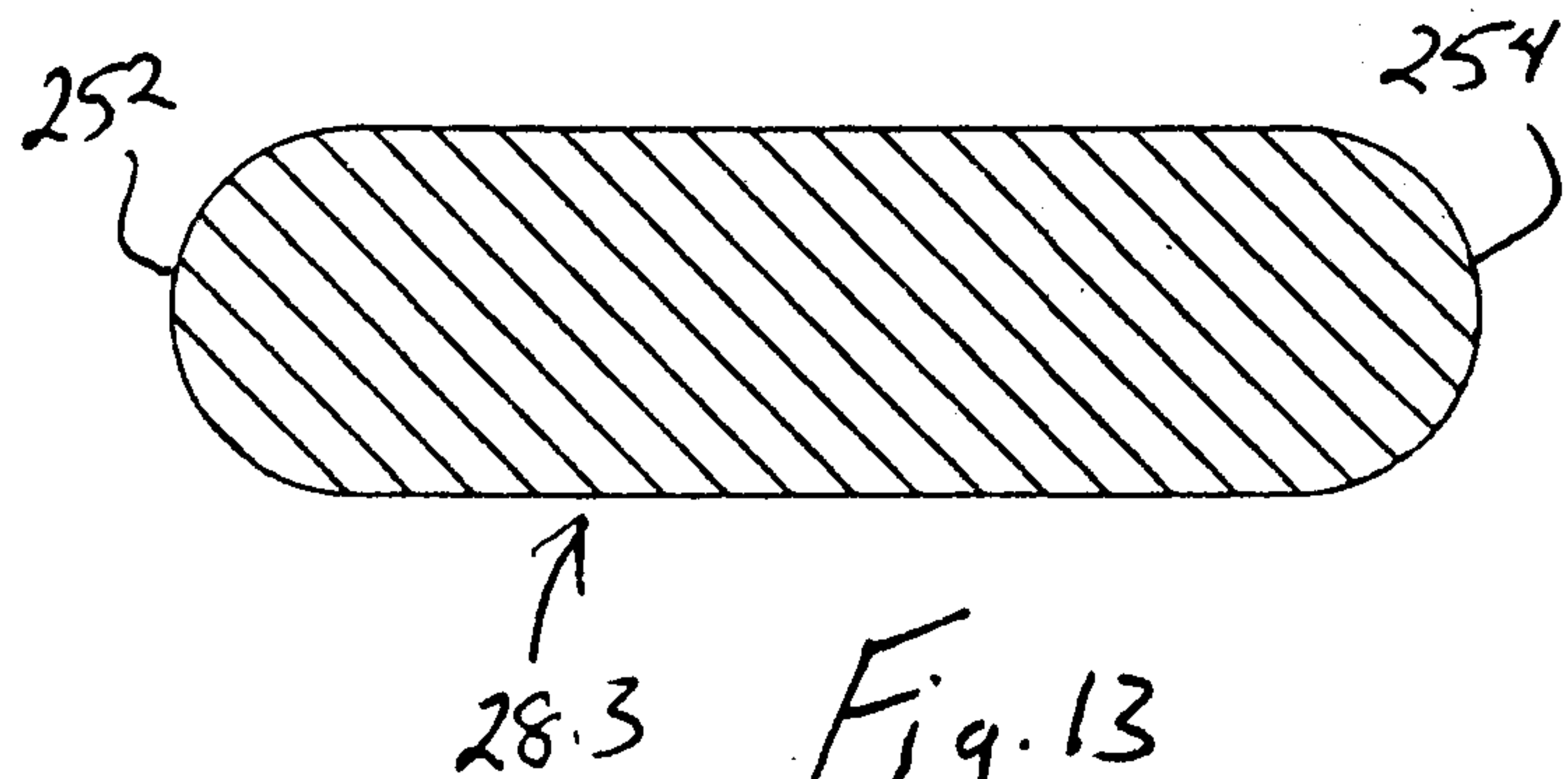
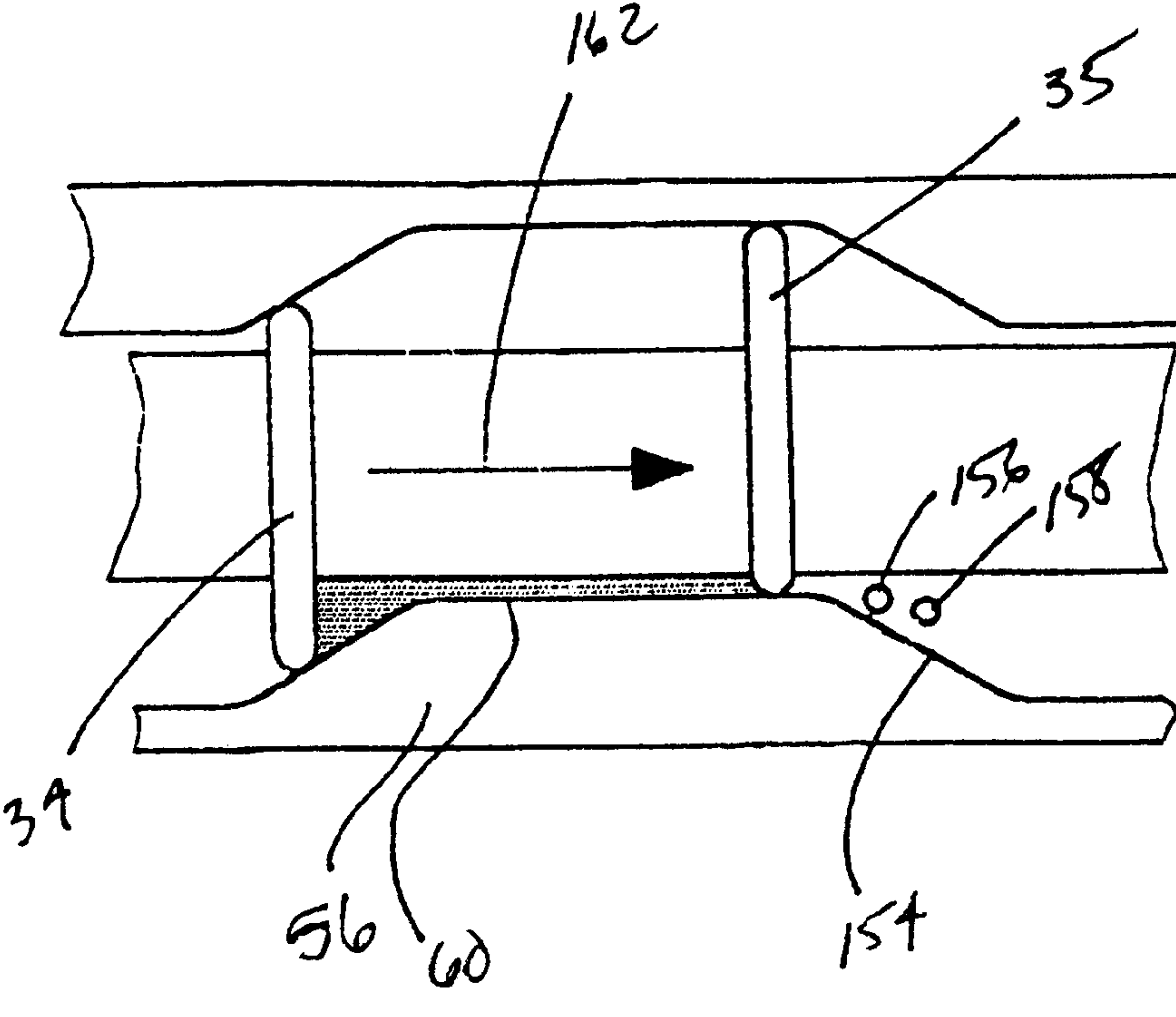


Fig. 13



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