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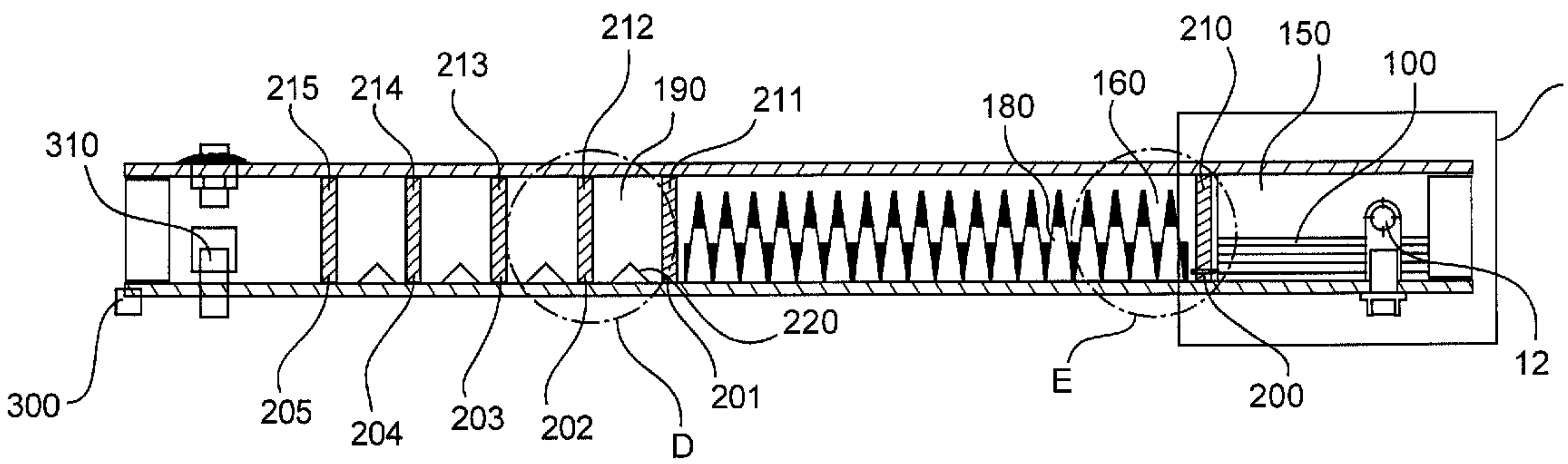
(54) **Titre : DISPOSITIF ET PROCEDE DE DEGAZAGE DE FLUIDES**
(54) **Title: FLUID DEGASSING DEVICE AND METHOD FOR DEGASSING FLUIDS**



(57) **Abrégé/Abstract:**
The invention relates to a fluid device for degassing fluids, in particular resins. The device has a fluid supply element 12 for the supply of the fluid, and a fluid discharge element 310 for the discharge of the fluid. Between the supply element 12 and the discharge element 310 there is provided at least one structural element 100, 180 for breaking down bubbles in the fluid as it flows through the structural element 100, 180. In addition or alternatively, there may be provided at least one profile element 220 over which the fluid must flow.

Abstract

The invention concerns a fluid degassing device for degassing fluids, in particular resins. The device has a fluid supply element 12 for supply of the fluid and a fluid discharge element 310 for discharge of the fluid. Between the supply element 12 and the discharge element 310 there is at least one structural element 100, 180 for breaking down bubbles in the fluid as it flows through the structural element 100, 180. In addition or alternatively there may be provided at least one profile element 220, over which the fluid must flow.

(Figure 1)

Fluid degassing device and method for degassing fluids

The present invention concerns a device for and a method of degassing fluids.

Synthetic resins are used in the production of composite fibre components. In that respect it is important for the resin to be as free as possible of air inclusions or bubbles as such air inclusions have the effect on the material of weakening the structure.

Thus degassing of the resin therefore has to be effected. Hitherto the resin is introduced into stirring containers and stirred under vacuum. In that case material degassing takes place only in the region near the surface.

A further variant for resin degassing is represented by the so-called thin-layer degassing operation. As already stated hereinbefore degassing happens in particular at the surface while the high viscosity of the resin allows the gas bubbles to rise out of the depth to the surface only slowly and therefore degassing is difficult. That necessitates long residence times.

As an alternative thereto it is also possible to use semi-permeable films to permit resin degassing.

As general state of the art attention is directed to WO 2003/064 144 A1 and US No 3 229 449 A.

Therefore the object of the invention is to provide for improved continuous degassing of a resin.

That object is attained by a device for degassing fluids as described below and a method of degassing fluids as described below.

Thus there is provided a fluid degassing device for degassing fluids, in particular resins. The device has a fluid supply element for supply of the fluid and a fluid discharge element for discharge of the fluid. Between the supply element and the discharge element there is at least one structural element for breaking down bubbles in the fluid as it flows through the structural element. In addition or alternatively there may be provided at least one profile element, over which the fluid must flow. The fluid degassing device further has a first chamber into which the fluid is fed by the fluid supply element. The first chamber has at least one first structural element in the form of a non-woven material. The device further has a second chamber which adjoins the first chamber. The second chamber has a second structural element which is in the form of a mesh and by way of which the fluid is passed.

In a further aspect there is a separating wall between the first and second chambers. The separating wall has at least one gap.

In a further aspect of the invention the device has a third chamber which adjoins the second chamber and which has at least one convex element.

In a further aspect of the invention there is a separating wall between the first and second chambers and it has at least one gap.

In a further aspect of the invention the device has a pivot axis for pivoting the device.

In a further aspect of the invention the device has a mesh element which is arranged around the fluid discharge element.

The invention also concerns a method of degassing fluids, in particular resins. For that purpose a fluid is supplied, bubbles in the fluid are broken down by passing the fluid through at least one structural element and/or the fluid is passed over at least one profile element. The fluid can then be discharged.

The invention also concerns a wind power installation rotor blade produced by a resin which has been degassed by the fluid degassing device.

The invention is described in greater detail hereinafter by means of embodiments by way of example and with reference to the drawings.

Figure 1 shows a diagrammatic sectional view of a resin degassing device,

Figure 2 shows a diagrammatic sectional view of a first end of a degassing device according to an embodiment of the invention,

Figure 3 shows a diagrammatic sectional view of a transition between a first and a second chamber of the degassing device of Figure 1,

Figure 4 shows a diagrammatic sectional view of a further transition between the second chamber and the third chamber in the degassing device of Figure 4, and

Figure 5 shows a diagrammatic sectional view of a detailed portion of an end of the third chamber of the degassing device.

Figure 1 shows a diagrammatic sectional view of a resin degassing device according to a first embodiment. This device serves for degassing and in that respect can be provided with a pivot mounting 300, by way of which the degassing device can be adjusted. The flow rate of the resin can be adjusted by the degree of inclination. In that case the inclination of the device can be set at between 1 and 10% and determines the resin layer thickness and the residence time in the vacuum and thus ultimately the degassing quality.

The resin to be degassed is introduced into a first chamber 150 through a connection 12. The resin then flows through a second chamber 160 into a third chamber 190 in order then to flow out by way of a flow discharge 310. In the first chamber 150 the resin flows out of the supply connection 12 through a non-woven material 100 to the bottom of the first chamber 150 in order to flow through a first gap 200 or an opening in a first wall 210 between the first and second chambers 150, 160 into the second chamber 160. A plurality of grills or meshes 180 are located in the second chamber. The resin must flow through the meshes 180 so that bubbles in the resin can be removed. The resin flows into the third chamber 190 through a second gap or opening 201 in a second wall 211 between the second and third chambers 160, 190. Provided in the third chamber 190 are a plurality of profile members 220, over which the resin flows. Thus the region of the resin, that is near the surface, is enlarged in size in the third chamber, which has a positive effect in degassing. Provided at the end of the third chamber 190 is a flow discharge 310, by way of which the degassed resin can flow away again.

Figure 2 shows a diagrammatic sectional view of a first end (detail F) of the degassing device of Figure 1. The resin is introduced into the container, that is to say into the first chamber 150, through a supply means (connection) 12. Provided beneath the supply connection 12 is at least one layer of non-woven material 100. In that case the non-woven material 100 should be of such a configuration that the resin can flow slowly therethrough. Thus, the first bubbles can already be removed from the resin by the structure of the non-woven material. The resin thus flows through the non-woven material 100 and through a first gap or opening 200 in the first wall 210 from the first chamber 150 into the second chamber 160.

Figure 3 shows a detailed view of the detail E in Figure 1, that is to say the transition between the first and second chambers 150, 160 in Figure 1. Arranged in the second chamber 160 are a plurality of transverse struts 170 respectively disposed at the top 162 and the bottom 161 of the chamber 160. Meshes 180 are stretched between the respective transverse struts 170 which have for example a mesh width of some millimetres. The resin flowing through the first opening 200 in the first wall 210 into the second chamber must overcome the first transverse strut 170 at the bottom 161 of the chamber and thus flows over that transverse strut 170 so that, in flowing down from the transverse strut 170, the resin must flow through the mesh 180. In addition the transverse struts 170 can optionally have gaps 206 at the bottom 161 of the second chamber 160. Accordingly, the provision of the transverse struts 170 provides that the resin flows upwardly at the transverse struts 170 so that the surface area of the resin is increased in size, which results in improved degassing. In addition, when flowing down from the transverse struts 170, the resin must flow through the meshes 180 which cause further degassing of the resin.

In that case the first gap 200 can be relatively thin in order to achieve a relatively thin resin layer flowing therethrough so that the bubbles are moved into the region near the surface. The viscosity or flow rate can be adjusted by means of the temperature. The meshes 180 can also be of a multi-layer nature. The mesh structure in that case can be made of plastic fibre or metal, as long as it is ensured that the mesh is not dissolvingly attacked or dissolved by the resin. Thus the mesh structure represents a parameter in respect of resin degassing. The transverse struts 170 do not necessarily have to terminate directly with the bottom 161 of the left-hand chamber 160, but there can also be gaps between the transverse struts and the bottom 161 of the left-hand chamber 160 so that the through-put rate in resin degassing can be increased.

Figure 4 shows a detail D of Figure 1, that is to say a transition between the second chamber 160 and a third chamber 190 which adjoins the second chamber at the left. The second separating wall 211 between the second chamber 160 and the third chamber 190 again has a second gap 201 at its lower side. Thus the resin is again forced to flow through that thin second gap 201, whereby the surface area or the region near the surface is further increased in size.

Profile members 220 are arranged in the third chamber 190 in such a way that the resin has to flow over the profile members so that this gives a further increase in the surface area or the region near the surface of the resin. Advantageously the profile members 220 are arranged upside down so that the resin can flow thereover. The profile members can be of a convex configuration. The third chamber 190 can be divided by a plurality of separating walls 212 - 215 each having a respective gap 202 - 205. At least one profile member 220 is arranged in each of the divided chambers. The fact that the gaps 202 - 205 between the chambers or portions in the further chambers 190 are only very narrow means that only a small amount of resin flows through the gap 202 - 205 so that resin can accumulate in front of the gap, that is to say a resin accumulation 230 occurs. Because only a thin resin film flows over the edges of the profile members 220 the region near the surface is increased in size, which has a positive effect in terms of degassing.

Figure 5 shows a detail H in Figure 1, that is to say a left-hand portion of the left-hand end of the third chamber 190. Shown here is a flow discharge connection 310 which is not disposed down in the bottom but is placed upwardly in such a way that only the uppermost layer of the resin is skimmed off. In addition there can be still a further mesh 320 to remove further bubbles from the resin.

Degassing of markedly more than 90% of the resin can be achieved with such a device. The entire device is operated under vacuum. The pressure in that respect is about 10 mbar.

The resin which has been degassed by the above-described fluid degassing device can be used for the manufacture of a wind power installation rotor blade. Alternatively to that the resin which has been degassed by the fluid degassing device can also be used for the manufacture of other components of a wind power installation.

CLAIMS

1. A fluid degassing device for continuously degassing resin(s), comprising

a fluid supply element (12) for supply of the resin(s),

a fluid discharge element (310) for discharge of the resin(s), and

a first chamber (150) into which the resin(s) is fed through the fluid supply element (12), with at least one first structural element (100) in the form of non-woven material for breaking down bubbles in the resin(s) through which the resin(s) is passed between the supply element (12) and the discharge element (310), with

a second chamber (160) which adjoins the first chamber (150), with at least one second structural element (180) in the form of a mesh, by way of which the resin(s) is passed and

a third chamber (190) which adjoins the second chamber (160), with at least one convex element (220) as a profile element (220) over which the resin(s) is passed between the fluid supply element (12) and the fluid discharge element (310).

2. A device according to claim 1 wherein a separating wall between the first and second chambers (150, 160) has at least one first gap (200).

3. A device according to claim 1 wherein a second separating wall between the second and third chambers (160, 190) has at least one second gap (201).

4. A device according to one of claims 1 to 3 comprising a pivot mounting (300) for pivoting the fluid degassing device.

5. A device according to one of claims 1 to 4 and further comprising a mesh element (320) arranged around the fluid discharge element (310).

6. A method of continuously degassing resin(s), comprising the steps:

supplying a resin(s),

breaking down bubbles in the resin(s) by passing the resin(s) through at least one structural element (100) in the form of a non-woven material in a first chamber (150) and by passing the resin(s) through a second structural element (180) in the form of a mesh in a second chamber (160) which adjoins the first chamber (150), and

passing the resin(s) over at least one profile element in form of a convex element in a third chamber (190), and

discharging the resin(s).

7. A resin(s) which has been degassed by a fluid degassing device according to one of claims 1 to 5.

8. A method of manufacturing a wind power installation rotor blade using the fluid degassing device according to one of claims 1 to 5.

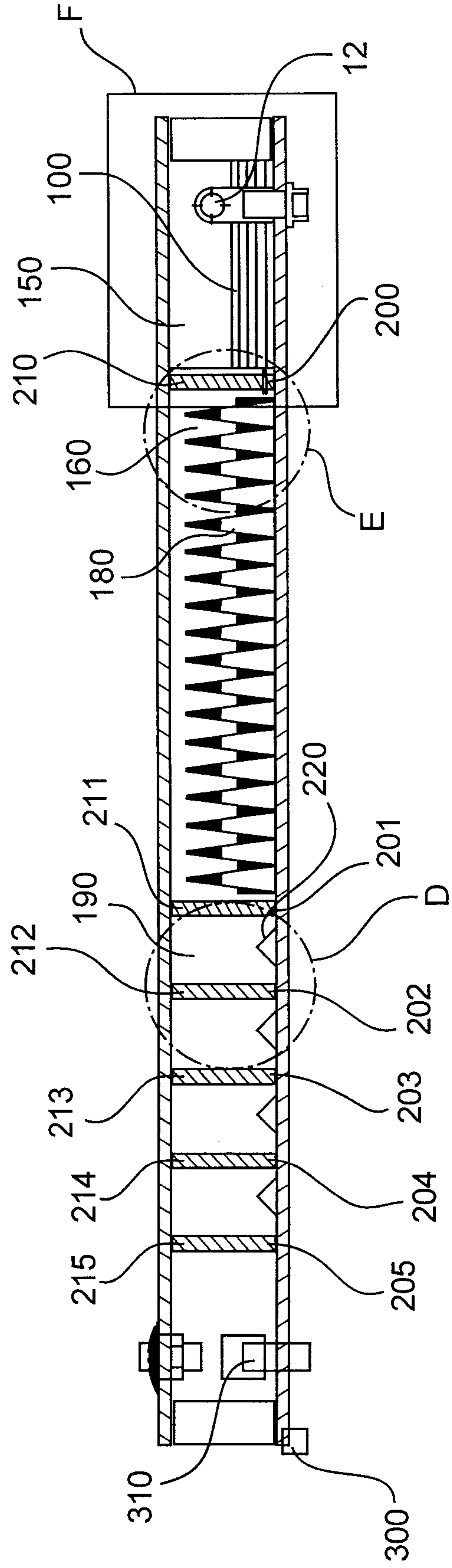

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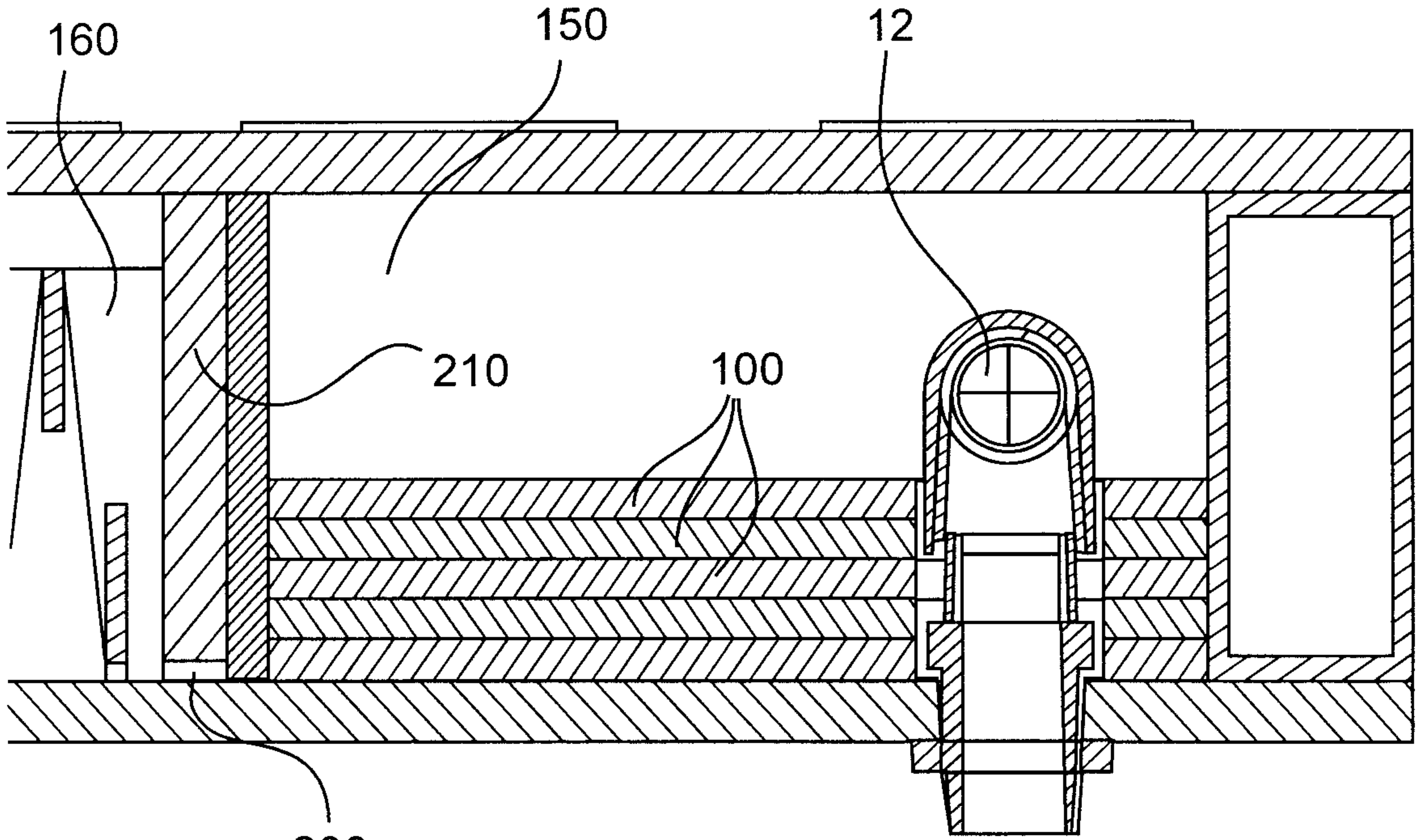
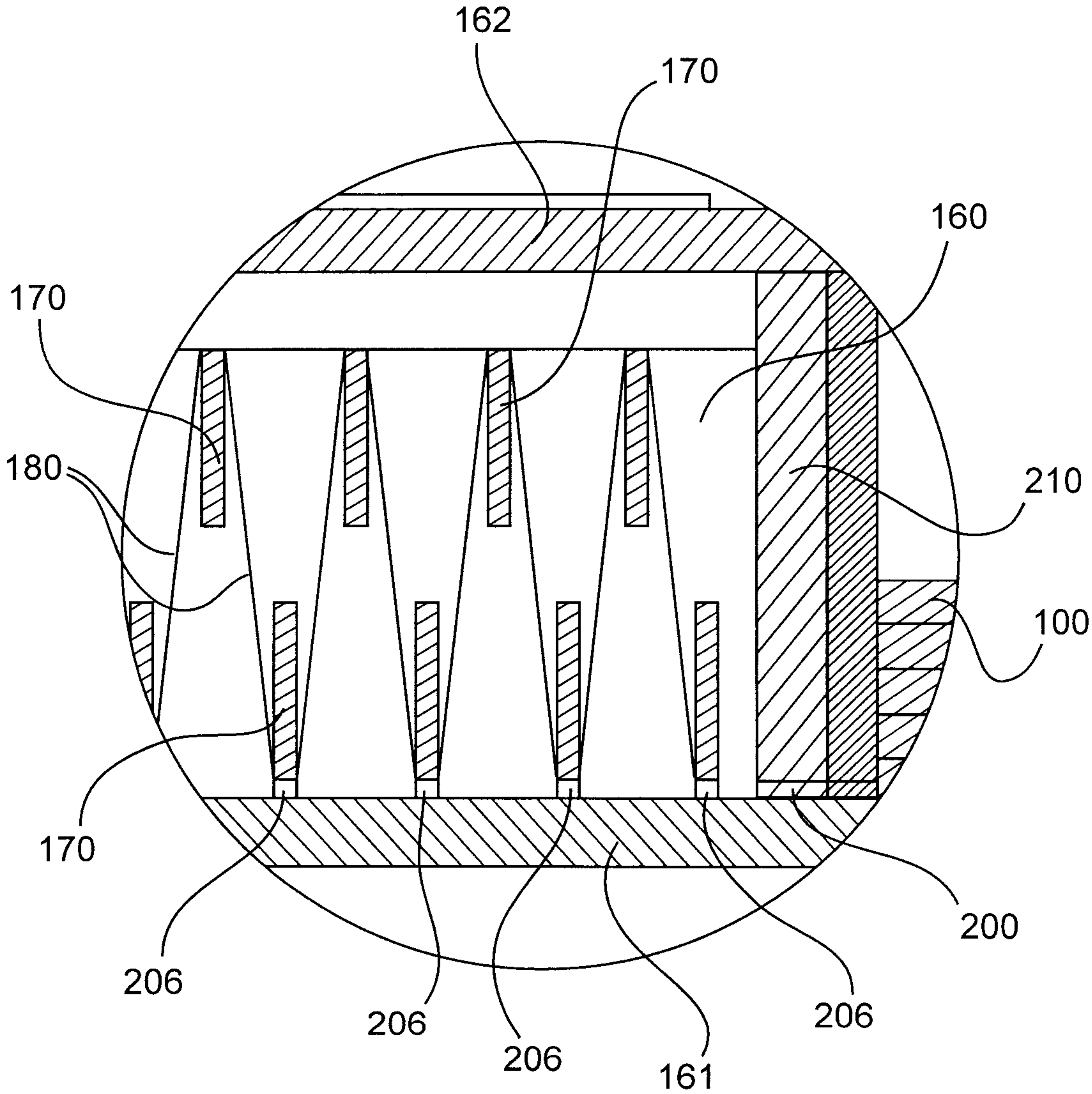
Fig.1



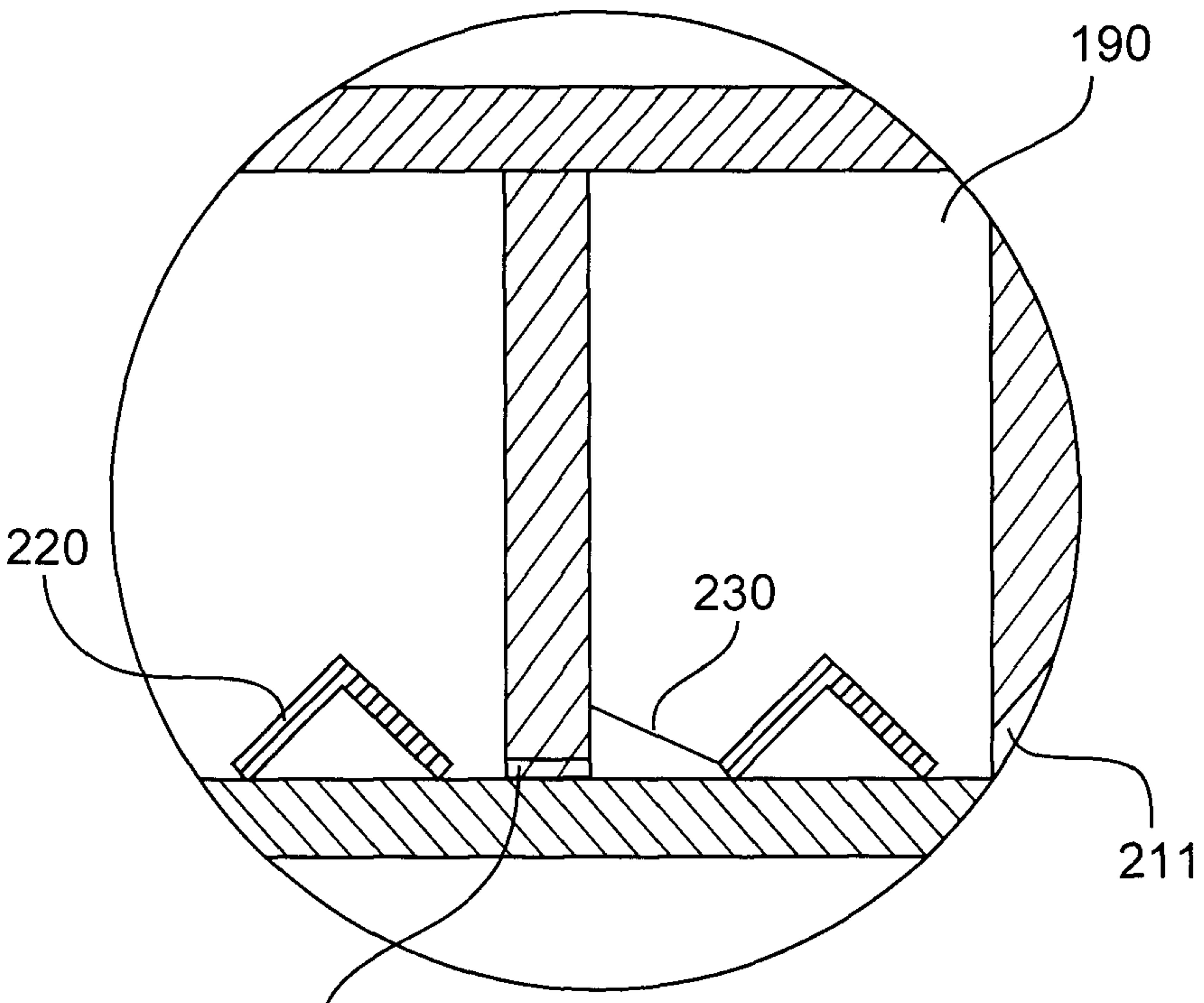
Detail F

Fig. 2



Detail E

Fig. 3



Detail D

Fig. 4

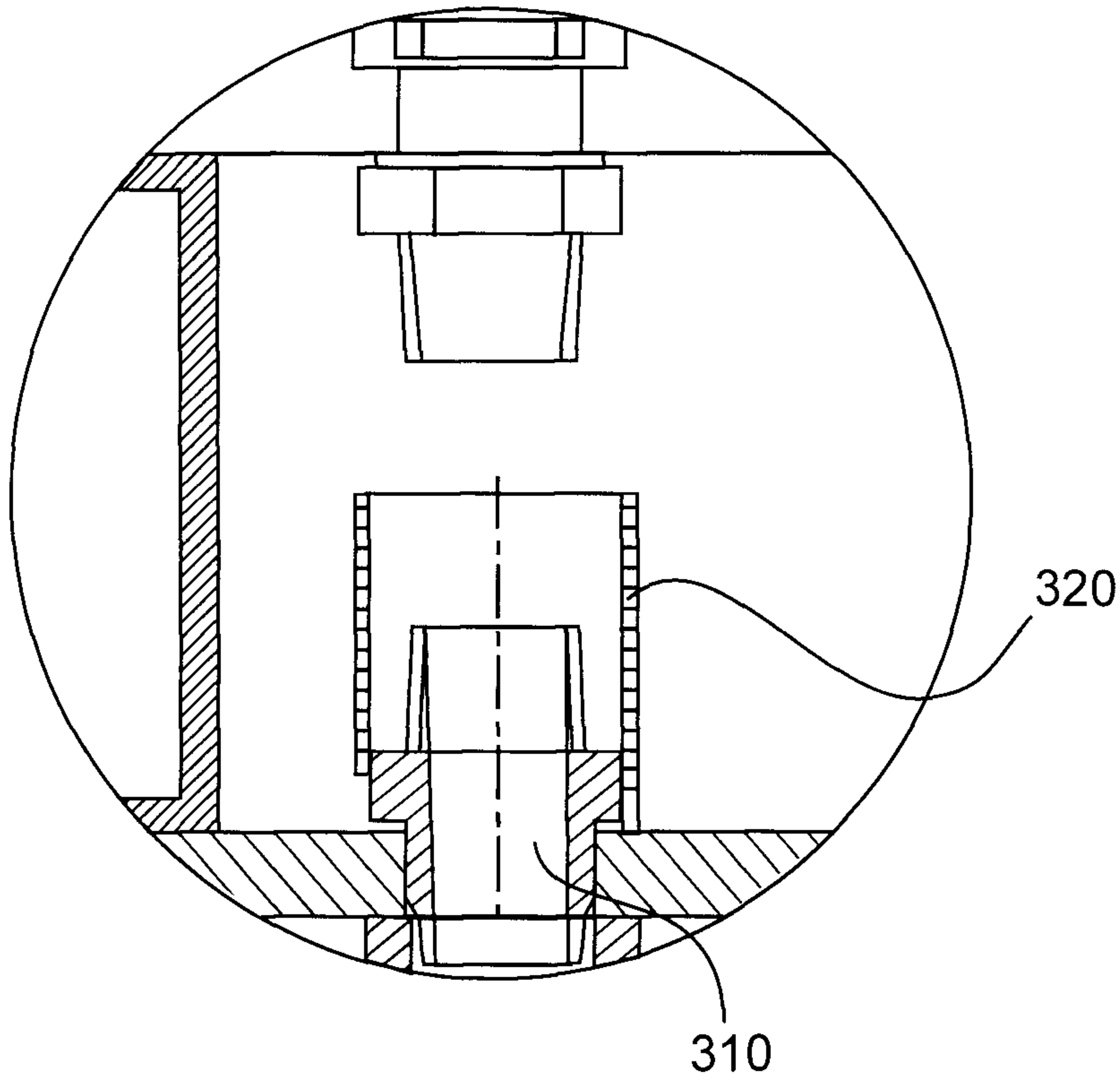
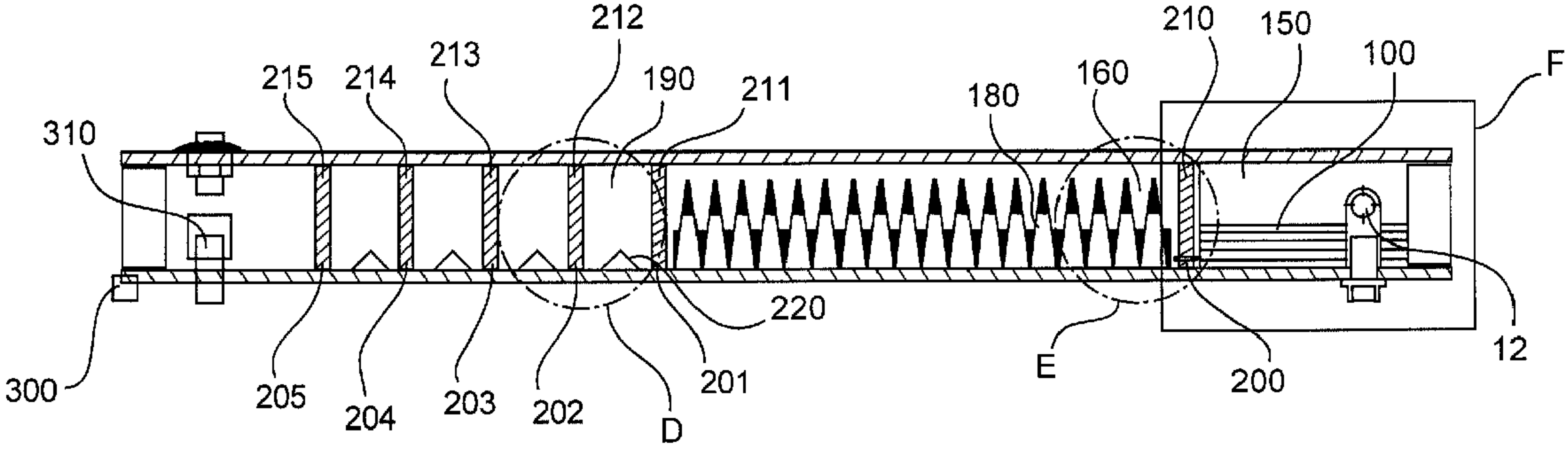


Fig. 5



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