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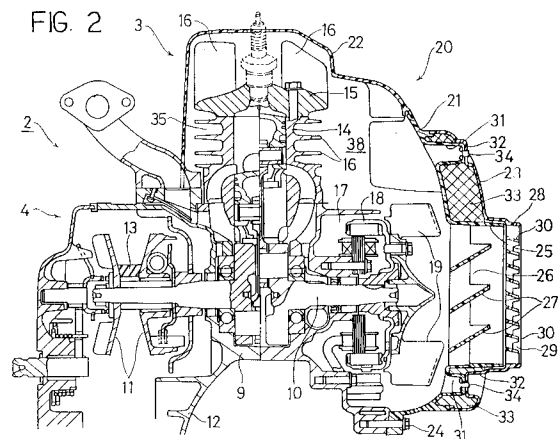
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54 **A shroud for an air-cooled internal combustion engine.**

57 In an air-cooled internal combustion engine a cylinder (14) positioned above a crank case (9) and a cylinder head (15) positioned above the cylinder are formed with a large number of radiation fins (16) arranged at predetermined intervals. A cooling fan (19) is integrally mounted on the rightmost end of a crank shaft (10). A synthetic resin shroud (20) which covers both the air-cooled type internal combustion engine (3) and the cooling fan (19) comprises a cylinder-side shroud (21) which covers both the cooling fan (19) of the engine (3) and the cylinder (14), a head-side shroud (22) which covers the cylinder head (15), and a shroud outer plate (23) which covers the outside of the cylinder-side shroud (21). In the cylinder-side shroud (21) there is formed a cylindrical opening (25), and an inner louver (26) is formed in the cylindrical opening (25). The inner louver comprises wide fins (27) which are inclined from the rear to the front in the outside direction from the inside and arranged longitudinally at wide intervals. In the shroud outer plate (23) there is formed a cylindrical opening (28) which is sideways projecting outwards, and an outer louver (29) is formed in the cylindrical opening (28). The outer louver (29) comprises relatively narrow fins (30) which are inclined from above to below in the outside direction from the inside and arranged vertically

at narrow intervals.



EP 0 604 937 A1

The present invention relates to a shroud with an opening for the intake of cooling air in an air-cooled type internal combustion engine, which shroud is superior in noise insulating performance.

In an air-cooled internal combustion engine for a scooter type two-wheeled motor vehicle wherein the heat radiating portion of the engine is covered with a shroud and, by rotation of a cooling fan integral with a crank shaft, cooling air is introduced into the shroud through a cooling air intake opening formed in the shroud to cool the heat radiating portion, a louver comprising fins which are arranged in parallel vertically at predetermined intervals and which are inclined from above to below in the outside direction from the inside, is provided in the cooling air intake opening of the shroud, as illustrated in Japanese Utility Model Publication No. 32903/88, in order to attain noise insulation and prevent outside rain water from entering the shroud.

In the case of the shroud described in the above utility model publication, an inner louver is mounted integrally with the shroud, and outside the inner louver there is detachably mounted a separate, outer louver having fins arranged on an extension plane of the inner louver fins, for enlarging the fin width at low cost. However, although the entry of rain water into the shroud can be prevented more certainly, the noise generated from the internal combustion engine and that from the cooling fan leak to the exterior along the fins even if the fin width is large, and thus it is impossible to obtain a satisfactory noise insulating effect.

The present invention concerns an improvement in the structure of a shroud opening for the intake of cooling air in an air-cooled type internal combustion engine, which is free of the above-mentioned inconvenience. In an air-cooled type internal combustion engine wherein a heat radiating portion of the engine is covered with a shroud and, by rotation of a cooling fan, cooling air is introduced into the shroud through a cooling air intake opening formed in the shroud to cool the heat radiating portion, the present invention is characterized in that an outer louver and an inner louver are formed each in an inclined state in the cooling air intake opening in such a manner that the direction of inclination of the outer louver and that of the inner louver are different from each other.

In the present invention, since the direction of inclination of the outer louver and that of the inner louver are made different from each other, most of the acoustic waves of noise generated from the internal combustion engine and that from the cooling fan are intercepted by the inner louver, and the acoustic waves of noise which have passed between the fins of the inner louver are intercepted by the outer louver which is inclined in a different

direction from the inner louver, thus resulting in that there is obtained a satisfactory noise insulating effect.

In a small sized vehicle having the air-cooled type internal combustion engine, to which the invention is applied, in an exposed state sideways to the outside of the vehicle body, if the outside louver is inclined from above to below in the outside direction from the inside and the inner louver is inclined from the rear to the front in the outside direction from the inside, as defined in claim 2, not only the entry of rain water descending along the outside of the vehicle into the shroud can be prevented by means of the outer louver, but also the wind flowing from the front to the rear along the outside of the vehicle can be introduced into the shroud through the cooling air intake opening by means of the inner louver, thereby permitting a further improvement of the cooling effect.

An embodiment of the present invention illustrated in the accompanying drawings will be described hereinafter.

In the drawings:

Fig. 1 is a right side view of the rear portion of a scooter type two-wheeled motor vehicle having a shroud for the intake of cooling air according to the present invention;

Fig. 2 is a vertical sectional view taken along line II-II in Fig. 1;

Fig. 3 is an enlarged side view of a principal portion of a shroud outer plate shown in Fig. 1;

Fig. 4 is an enlarged side view of a cylinder-side shroud shown in Fig. 1; and

Fig. 5 is a sectional view taken on line V-V in Fig. 4.

A swing type power unit 2 mounted on a scooter type two-wheeled motor vehicle 1 comprises an air-cooled type internal combustion engine 3 standing up in a slightly obliquely downwardly inclined state and a V belt type stepless (infinitely variable) speed change mechanism 4 extending backward from one lower side of the engine 3, the engine 3 and the speed change mechanism 4 being integrally coupled together. A rear wheel 5 is integrally fitted on an output shaft (not shown) of the V belt type stepless speed change mechanism 4, and a hanger portion 6 positioned in the front portion of the swing type power unit 2 is attached vertically swingably to a bracket 8 which is projecting backward from a body 7 of the scooter type two-wheeled motor vehicle 1.

A crank shaft 10 is supported rotatably within a crank case 9 of the engine 3, and a driving variable pulley 11 of the stepless speed change mechanism 4 is mounted on the leftmost end of the crank shaft 10. A V belt 13 is entrained around the driving variable pulley 11 and a driven variable pulley (not shown) is journaled in the rear portion of a trans-

mission case 12. With increase in the number of revolutions of the crank shaft 10, the change gear ratio of the stepless speed change mechanism 4 decreases in a stepless manner and the power of the engine 3 is transmitted to the rear wheel 5 through the speed change mechanism 4.

Further, a cylinder 14 located above the crank case 9 and a cylinder head 15 above the cylinder are formed with a large number of radiation fins 16 at predetermined intervals. A rotor 18 of a generator 17 is integrally fitted on the rightmost end of the crank shaft 10, and a centrifugal type cooling fan 19 is integrally mounted to the rotor 18.

The air-cooled type internal combustion engine 3 and the cooling fan 19 are covered with a shroud 20 made (for example) of a synthetic resin. The shroud 20 comprises a cylinder-side shroud 21 which covers the cooling fan 19 and the cylinder 14 of the engine 3, a head-side shroud 22 which covers the cylinder head 15, and a shroud outer plate 23 which covers the outside of the cylinder-side shroud 21. The cylinder-side shroud 21 and the head-side shroud 22 are mounted to the crank case 9, cylinder 14, etc. removably, with mounting bolts 24.

In the cylinder-side shroud 21 there is formed a cylindrical opening 25 which is concentric with the cooling fan 19, and an inner louver 26 is formed in the cylindrical opening 25. The inner louver 26 comprises wide fins 27 inclined from the rear to the front in the outside direction from the inside and arranged longitudinally at wide intervals. In the shroud 23 there is formed a cylindrical side opening 28 projecting outwards in close contact with the outer peripheral surface of the cylindrical opening 25 of the cylinder-side shroud 21. Further, an outer louver 29 is formed in the cylindrical opening 28. The outer louver 29 comprises relatively narrow fins 30 inclined from above to below in the outside direction from the inside and arranged vertically at narrow intervals.

The cylinder-side shroud 21 is formed with side mounting seats 31 projecting outwards. The mounting seats 31 are formed one in an upper position and two in lower positions. The shroud outer plate 23 is also formed with inwardly projecting mounting seats 32 in positions corresponding to the positions of the mounting seats 31. A noise absorbing material 33 such as polyurethane sponge is interposed between the cylinder-side shroud 21 and the shroud outer plate 23 and throughout the whole side face with the exclusion of the cylindrical openings 25 and 28. Rivets 34 are fitted in the mounting seats 31 and 32 to couple the cylinder-side shroud 21 and the shroud outer plate 23 integrally with each other. With rotation of the cooling fan 19, cooling air is introduced into the shroud 20 from the cylindrical opening 28 of the

shroud outer plate 23 through the cylindrical opening 25 of the cylinder-side shroud 21. During this period, the cooling air flows to the cylinder head 15 side while in contact with the radiation fins 16 and is thereafter discharged into the atmosphere from a cooling air discharge port 35 formed in a left-hand rear position of the head-side shroud 22.

In the cylinder-side shroud 21, as shown in Fig. 4, there are formed many holes 36 in a surrounding relation to the outer periphery of the cylindrical opening 25. The noise absorbing material 33 is exposed into a cooling air passage 38 through the holes 36.

On the outer surface of the cylinder-side shroud 21 there are formed quadrangular pyramid-shaped engaging lugs 37c, 37d and 37e in three positions and each in a plural number between holes 36 formed around the cylindrical opening 25. The noise absorbing material 33 is fixed by those engaging lugs 37.

Since the illustrated embodiment is constructed as above, when the air-cooled type internal combustion engine 3 starts operating and the cooling fan 19 is rotated, the outside air present on the right-hand side of the swing type power unit 2 is introduced into the cooling air passage 38 in the shroud 20 from the cylindrical opening 28 of the shroud outer plate 23 through the cylindrical opening 25 of the cylinder-side shroud 21, then while being heated by contact with the radiation fins 16 of the cylinder 14 and cylinder head 15, it is discharged to the outside of the shroud 20 through the cooling air discharge port 35.

Thus, the cylinder 14 and the cylinder head 15 are cooled to a satisfactory extent.

Even if noise is generated from the engine 3 and the cooling fan 19 upon operation of the engine, the noise in the cooling air passage 38 is intercepted by the shroud 20 which covers the engine 3 and the fan 19, and is absorbed by the noise absorbing material 33 exposed into the passage 38 through the holes 36. Consequently, the noise level outside the power unit 2 becomes lower to a remarkable extent.

Moreover, in the cylindrical openings 25 and 28, since the fins 27 of the inner louver 26 and the fins 30 of the outer louver 29 are inclined in directions different from each other, the acoustic waves of noise which have passed between the fins 27 of the inner louver are changed in their travelling direction by the fins 30 of the outer louver 29, so that the noise insulating effect is improved and the level of the noise generated from the engine 3 and the cooling fan 19 can be further reduced.

Further, since the fins 30 of the outer louver 29 are inclined from above to below in the outside direction from the inside, rain water descending from above is allowed to drop to the exterior of the

vehicle from the lower edges of the fins 30 and thus it is possible to prevent the entry of rain water into the cooling air passage 38.

Additionally, since the fins 27 of the inner louver 26 are inclined from the rear to the front in the outside direction from the inside, the wind which has flowed from the front toward the rear on the right-hand side of the swing type power unit 2 and passed between the fins 30 of the outer louver 29 can be introduced positively into the cooling air passage 38. Thus, it is possible to increase the flow rate of cooling air and thereby further enhance the cooling effect.

Claims

1. A shroud (20) for an air-cooled type internal combustion engine (3) wherein a heat radiating portion (15, 16) of the engine (3) is covered with the shroud (20) and, by rotation of a cooling fan (19), cooling air is introduced into the shroud (20) through a cooling air intake opening (25) formed in the shroud (20) to cool the heat radiating portion (15, 16); the shroud (20) being characterized in that an outer louver (29) and an inner louver (26) are formed each in an inclined state in said cooling air intake opening (25) in such a manner that the direction of inclination of said outer louver (29) and that of said inner louver (26) are different from each other.
2. A shroud according to claim 1, wherein said outer louver (29) is inclined from above to below in the outside direction from the inside, while said inner louver (26) is inclined from the rear to the front in the outside direction from the inside.

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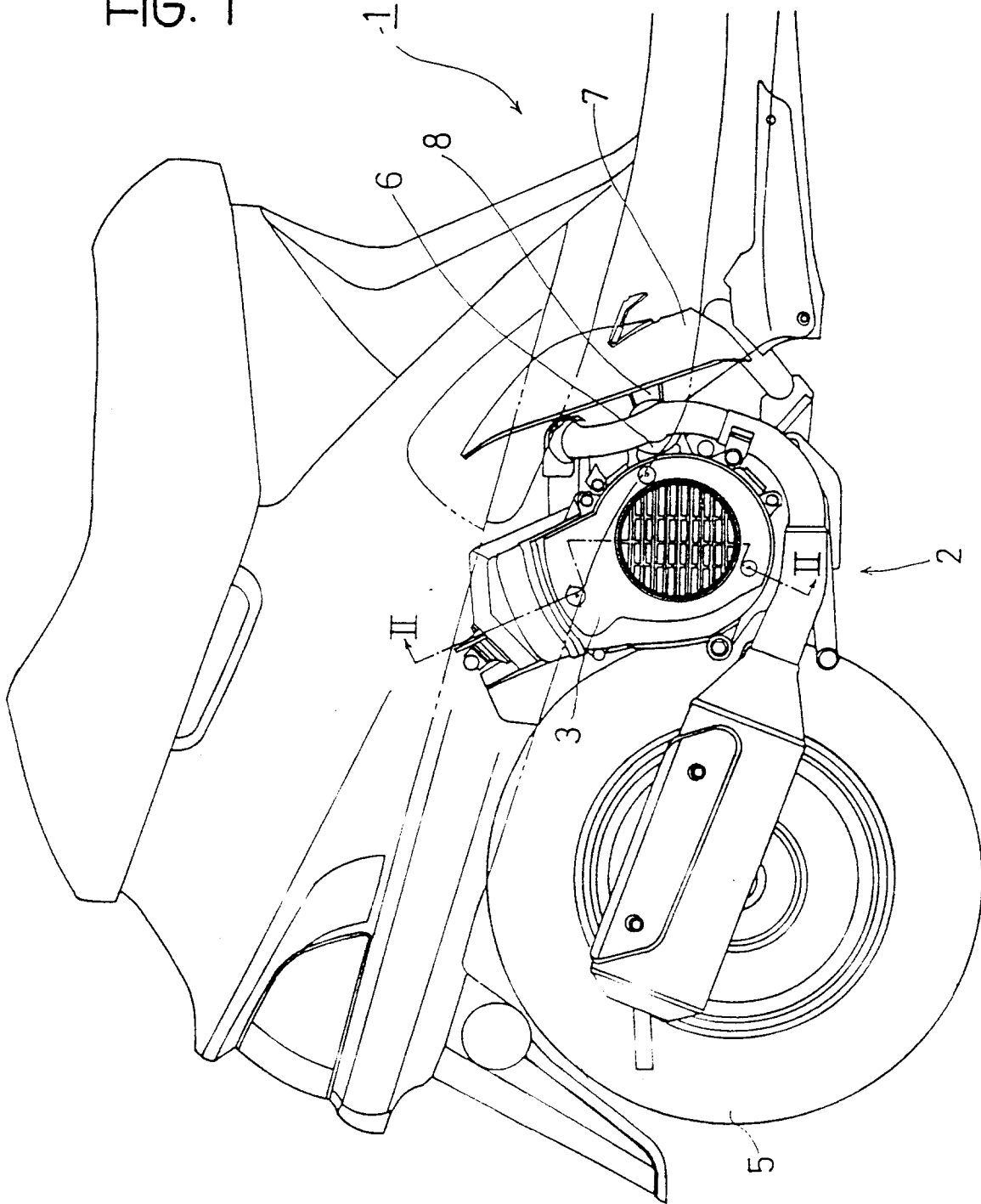
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FIG. 1



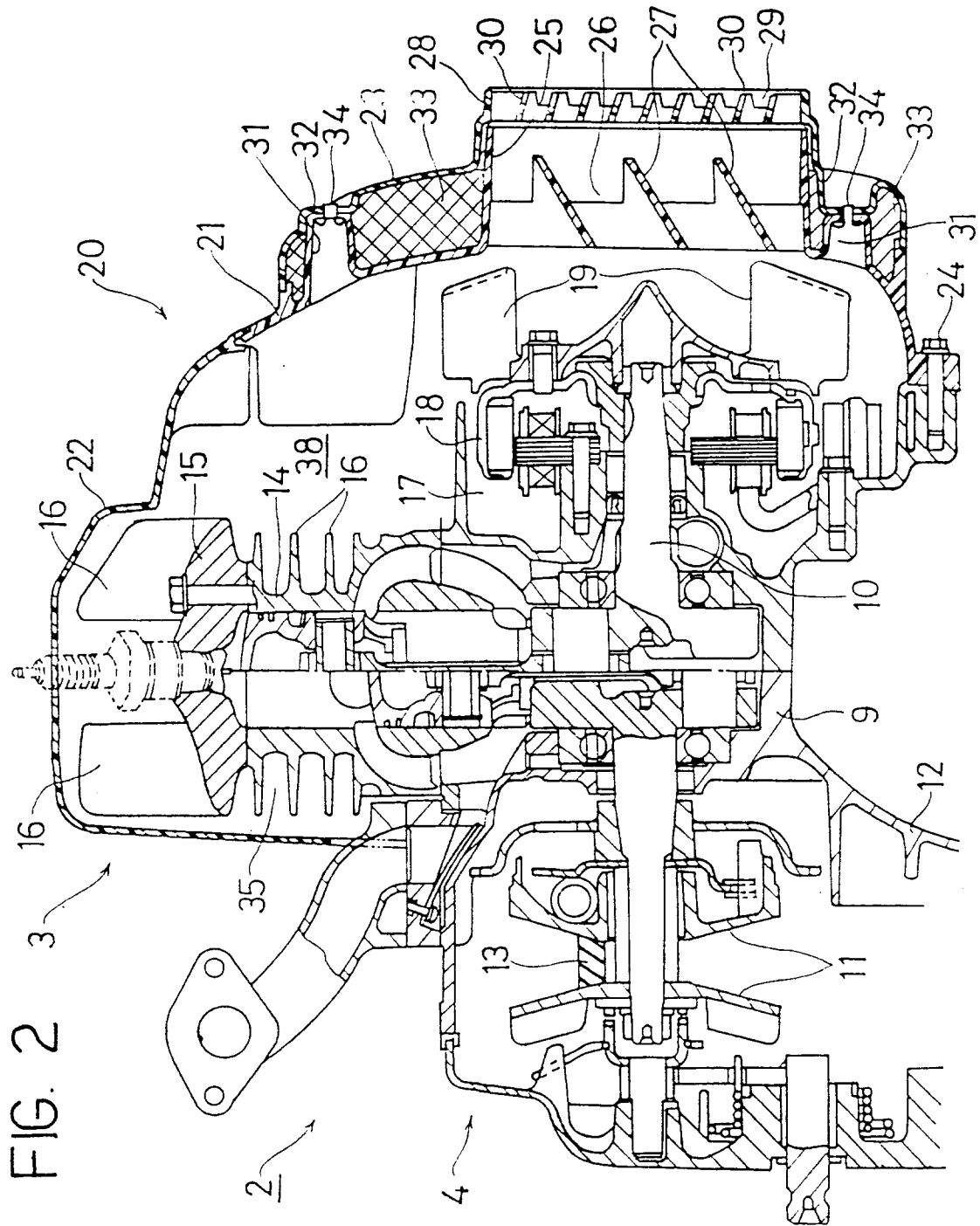
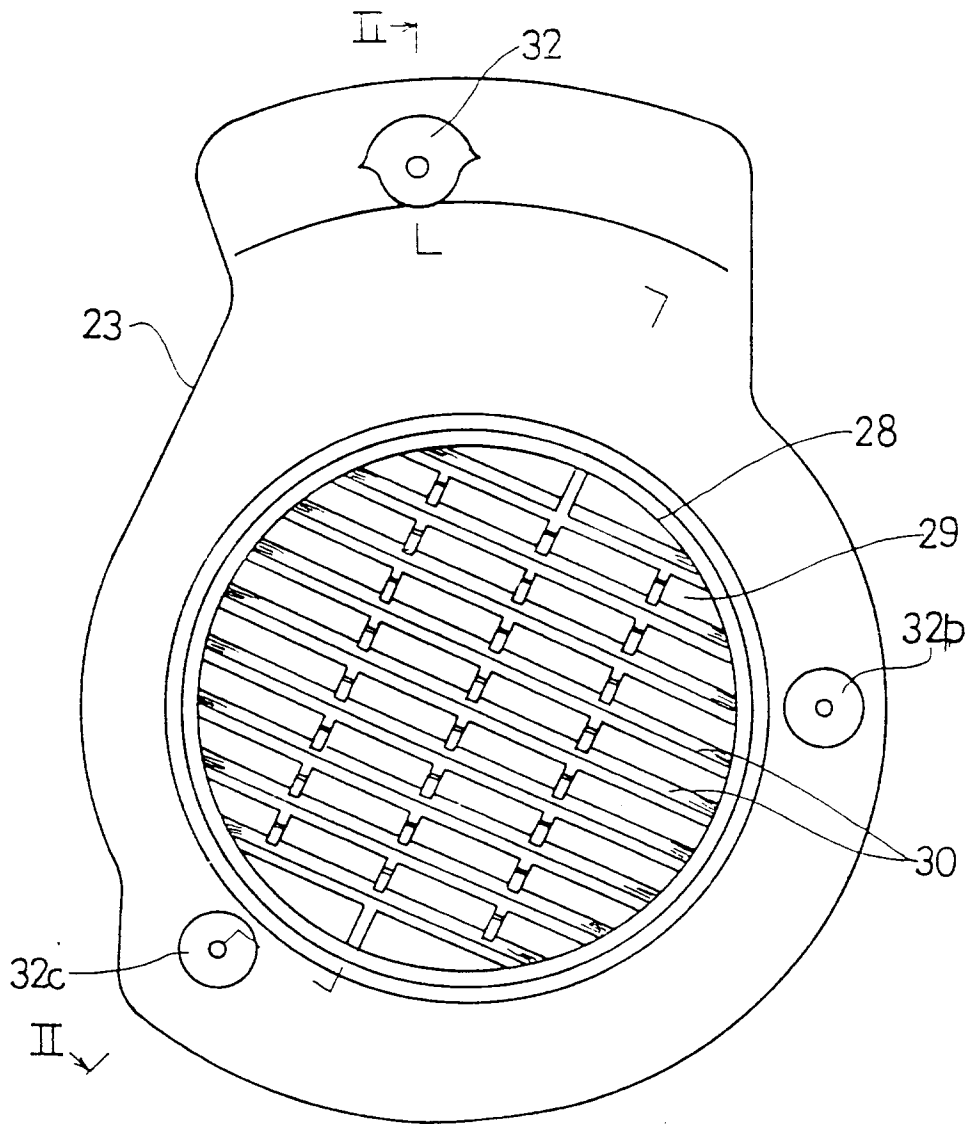


FIG. 3



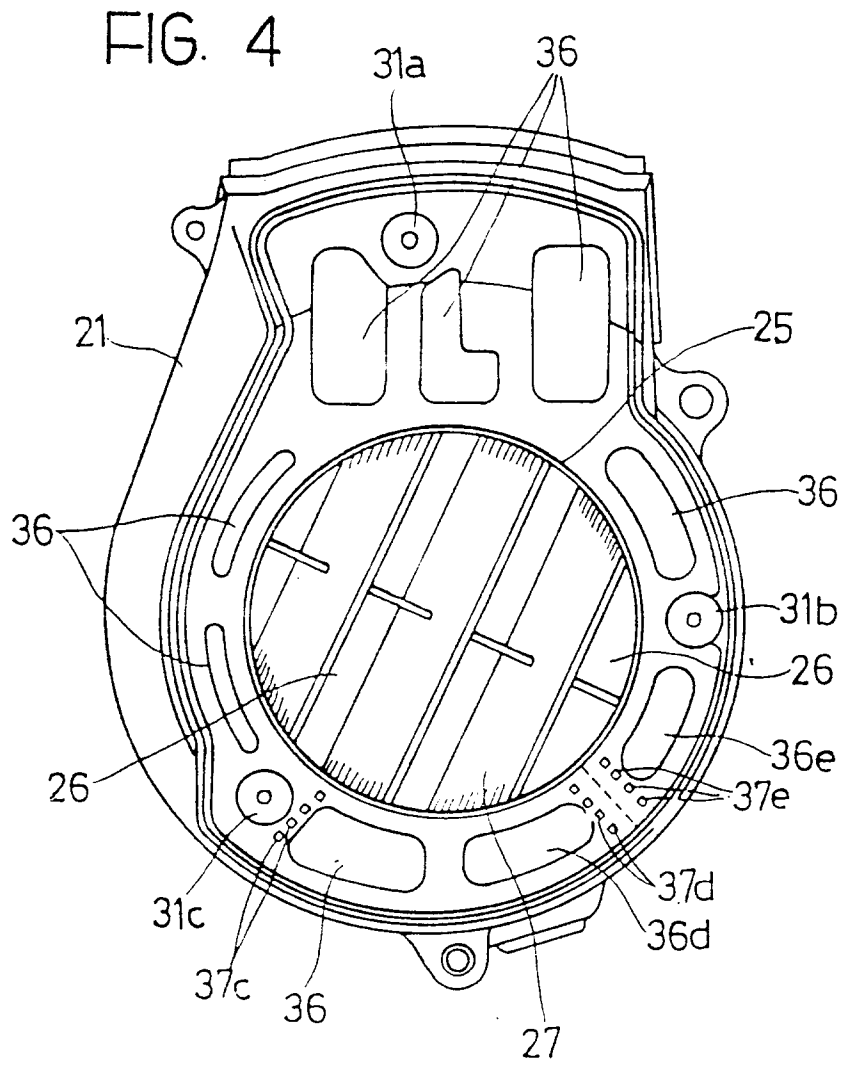
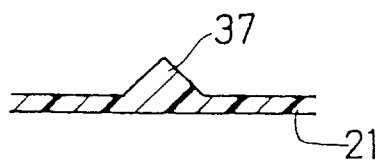


FIG. 5





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	FR-A-2 479 324 (DEERE & COMPAGNY) * the whole document * ---	1,2	F01P11/12 F02B77/13
A	US-A-4 546 843 (KOINUMA ET AL.) * column 2, line 39 - line 48; figures * ---	1	
A	PATENT ABSTRACTS OF JAPAN vol. 11, no. 114 (M-579)10 April 1987 & JP-A-61 258 916 (KAWASAKI HEAVY IND) 17 November 1986 * abstract * * figure * ---	1	
A	FR-A-2 309 717 (KABUSHIKI KAISHA KOMATSU SEISAKUSHO) * figure 7 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			F01P F02B B60R
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		16 March 1994	Kooijman, F
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