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Applicant: **Mihama Manufacturing Co., Ltd.,**
11417 Miyagawa, Chino-shi Nagano-ken (JP)
Applicant: **Kato Hatsujo Kaisha Ltd., 51 Iwai-cho**
Hodogaya-ku, Yokohama-shi Kanagawa-ken (JP)

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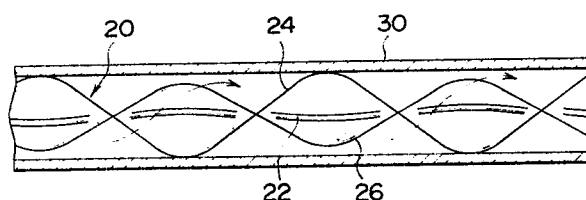
Inventor: **Ohkata, Ichizo, 50-22 Chuoh 2 chome, Nishi-ku**
Yokohama-shi Kanagawa-ken (JP)
Inventor: **Hama, Taira, 11300-2 Miyagawa, Chino-shi**
Nagano-ken (JP)

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Representative: **Jennings, Guy Kenneth et al, GILL**
JENNINGS & EVERY 53/64 Chancery Lane, London
WC2A 1HN (GB)

54 Turbulence inducing members.

57 A plastics turbulence inducing member 20 comprises a shaft portion 22 and a pair of helical ribs 24, 26 extending radially from the shaft portion. The rib 24 has a greater radial extent than the rib 26 and forms a close fit with a pipe 30 for a fluid in an air conditioning system for example, while the rib 26 stops short of the wall of the pipe. The member 20 is thus held firmly in position and increased turbulence is induced, thereby enhancing the heat exchange efficiency.



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Mihama Manufacturing Co. Ltd
and Kato Hatsujo Kaisha Ltd.

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Turbulence inducing members

5. This invention relates to turbulence inducing members for insertion into a pipe for a fluid such as a refrigerant in various kinds of air conditioning systems for inducing turbulence in the flow of the fluid thereby enhancing the heat exchange efficiency

10. There have been previous proposals for turbulence inducing members, such as those made of metal in the shape of a ribbon or in helical form and those made of a synthetic resin which is light in weight and easy to manufacture. French patent no: 77.30460, for example, discloses a plastics turbulence inducing member which is provided with a pair of equal helical ribs and
15. having its maximum outside diameter slightly smaller than the inside diameter of the pipe into which it is to be inserted. Since such a plastics turbulence inducing member is a loose fit in the fluid pipe, it vibrates with-
20. in the fluid pipe in the direction of fluid flow and/or is rotated around its axis by the flow of the fluid, which leads to a disadvantageous decrease in efficiency in the production of turbulence. When such a plastics turbulence inducing member is



used in an air conditioning system for example, installed within a room, it rattles against the inner wall of the fluid pipe due to the aforementioned vibration and/or rotation, thereby giving rise to noise. Particularly when such an air conditioning system is operated at night, the noise resounds throughout the room and disturbs the occupants.

The main object of the present invention is to provide a plastics turbulence inducing member which is neither vibrated nor rotated within the fluid pipe by the flow of the fluid, thereby preventing the generation of noise and enhancing the turbulence inducing efficiency.

According to the present invention a plastics turbulence inducing member having at least two helical ribs is characterised in that one of the ribs has a radial extent different from that of the other rib or ribs.

The invention will now be described in more detail, with reference to the accompanying drawings, in which:-

Figures 1 (A) and 1(B) are longitudinal and cross sectional views respectively illustrating a conventional plastics turbulence inducing member which has been inserted into a fluid pipe;

Figure 2 is a side view illustrating one embodiment of a plastics turbulence inducing member according to the present invention;

Figures 3(A) 3(B) and 3(C) are cross



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sectional views of the turbulence inducing member of Figure 2, taken along lines A - A, B - B and C - C in Figure 2, respectively:

5. Figure 4 is a longitudinal sectional view illustrating the turbulence inducing member of Figure 2 inserted into a pipe; and

Figure 5 is a cross sectional view illustrating another embodiment of turbulence inducing member according to the present invention.

10. Figure 1 shows a conventional turbulence inducing member 10 made of a synthetic resin and provided with two helical ribs 12 and 14 which are equal in radial extent. The turbulence inducing member 10 formed by the two ribs 12 and
15. 14 has a maximum diameter which is slightly smaller than the inside diameter of a pipe 16 for fluid so that it may easily be inserted into the pipe 16. For this reason, the turbulence inducing member 10 is vibrated in the direction in which the fluid
20. flows and/or rotated around its axis by the flow of the fluid, with the result that the turbulence induced in the fluid is reduced by the amount of the vibrating movement and/or rotating movement and, at the same time, the vibration and/or rotation
25. of the turbulence inducing member 10 allows the member to rattle against the inner wall of the pipe 16 to thereby make noise.

The disadvantages suffered by the conventional turbulence inducing member are eliminated
30. by the invention as will now be described with



reference to the remaining Figures.

5. The turbulence inducing member 20 shown in Figures 2 and 3 comprises a shaft portion 22 and two helical ribs 24 and 26 of different radial extents which have curved leading end portions 24a and 26a, with pointed leading edges. The maximum width L of the turbulence inducing member 20 at any point is smaller than the inside diameter of a fluid pipe 30 to be described later. However, 10. the diameter of a circle P having a radius equal to the distance between the centre of the shaft portion 22 and the outermost edge of the longer helical rib 24 is slightly larger than the inside diameter of the fluid pipe 30.

15. To show the shape of the turbulence inducing member 20 more, cross sectional views of three portions of the turbulence inducing member taken at a given pitch are illustrated in Figures 3(A), 3(B) and 3(C).

20. The turbulence inducing member 20 is easily manufactured,, though not illustrated, by rotatably attaching to an extruder a mouthpiece having an outlet of a shape identical with the cross section of the turbulence inducing member, 25. extruding a synthetic resin from the outlet while rotating the mouthpiece, helically twisting the synthetic resin while in a softened state between the mouthpiece and a cooling vessel by means of the rotation of the mouthpiece, passing the 30. synthetic resin through water in the cooling vessel,



thereby cooling and hardening the synthetic resin, and drawing the synthetic resin from the cooling vessel. Optionally, the softened synthetic resin may be drawn by rotating the synthetic resin itself with the mouthpiece fixed to the extruder.

When the turbulence inducing member 20 is inserted into the fluid pipe 30, the curved leading end portion 24a of the helical rib 24 comes into contact with the inner wall of the fluid pipe 30 along its helical pitch. As the insertion proceeds, the shaft portion 22 is substantially helically deformed within the fluid pipe 30 as illustrated in Figure 4. Therefore, the deformation of the shaft portion 22 urges the curved leading end portions 24a of the rib 24 to forcibly contact the inner wall of the fluid pipe 30. The turbulence inducing member 20 is thus retained fast within the fluid pipe 30 with the curved leading end portions 24a kept in intimate contact with the inner wall of the fluid pipe 30. Therefore, the turbulence inducing member 20 is neither vibrated in the direction in which the fluid flows nor rotated about the shaft portion 22. When the turbulence inducing member 20 has been inserted into the fluid pipe 30, the main part of the fluid within the pipe flows along the radially longer helical rib 24 and the curved surfaces of the curved leading end portions 24a. On the other hand, part of the fluid flows so as to ride over the curved leading end portions 26a of the radially



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shorter helical rib 26 and continues to converge upon and diverge from the main fluid flow. Therefore, turbulence is promoted in the fluid.

The turbulence inducing member just described has two helical ribs, but the number of ribs is not limited to two. The turbulence inducing member may have three or more helical ribs at least one of which has a radial extent different from that of the remainder. An example of a turbulence inducing member having three helical ribs 24, 26 and 28 is illustrated in Figure 5.

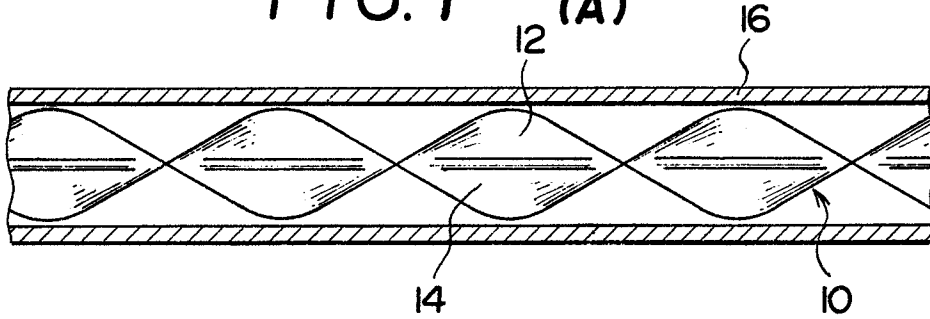
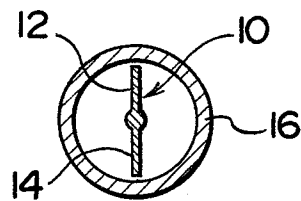
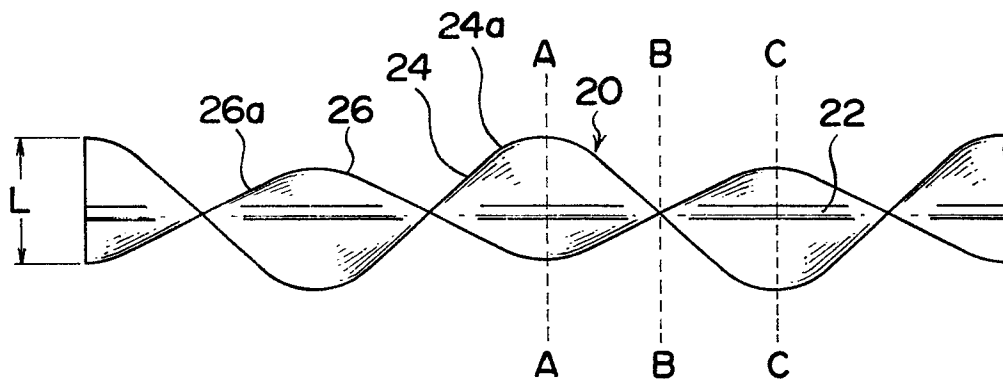
Since a turbulence inducing member according to the present invention is held fast within the fluid pipe, it is possible to avoid completely either vibration or rotation of the turbulence inducing member within the fluid pipe due to the flow of the fluid and to effectively prevent the generation of noise due to the rattling of the turbulence inducing member against the inner wall of the fluid pipe, with the result that the turbulence efficiency can be kept high. Furthermore, since part of the fluid flow rides over the radially shorter helical rib and continues to converge upon and diverge from the main fluid flow, the turbulence efficiency can be promoted to a major extent. That is to say, the heat exchange efficiency can satisfactorily be enhanced.

C L A I M S

1. A plastic turbulence inducing member for insertion into a pipe for inducing turbulence in the flow of fluid, comprising a shaft portion and at least two helical ribs extending radially from the shaft portion, characterised in that one of the ribs has a radial extent different from that of the other rib or ribs.

2. The combination of a plastics turbulence inducing member according to claim 1 and a pipe of which the diameter is slightly less than that of a circle P having a radius equal to the distance between the centre of the shaft portion and the outermost edge of the helical rib having the greatest radial extent.



FIG. 1 (A)**FIG. 1 (B)****FIG. 2**

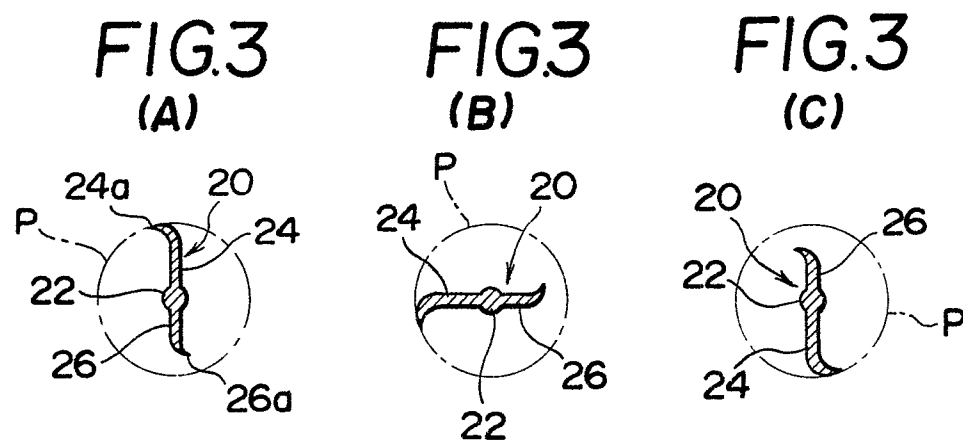


FIG.4

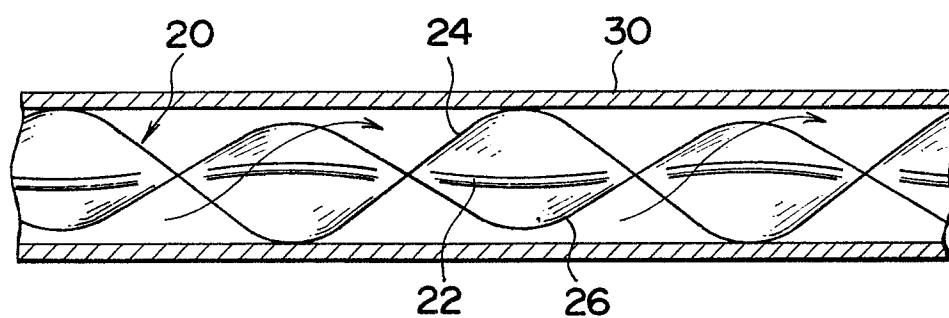
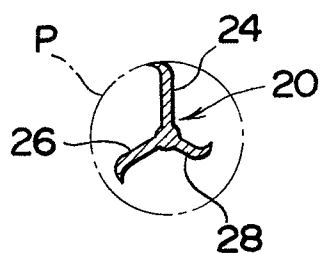


FIG.5





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EUROPEAN SEARCH REPORT

0077130

Application number

EP 82 30 4794

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. 3)
A	FR-A-1 425 901 (BROWN FINTURE COMPANY) *Claims point 11; figures*	1	F 15 D 1/06 F 28 F 13/12 B 01 F 5/06
A	GB-A-1 027 933 (THE ENGLISH ELECTRIC COMPANY)		
A	DE-A-2 104 219 (ZIMMER AG.)		
D, A	FR-A-2 404 511 (SOGEX)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			F 15 D F 16 L F 28 F B 29 B B 01 F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19-01-1983	Examiner VAN REETH A.L.J.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			