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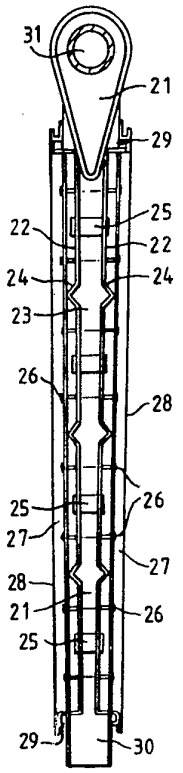
(54) Title: BLADES FOR ISOLATORS

(57) Abstract

A blade for an isolator, in particular for a diverter of flap isolator, which comprises a plurality of plate arms (21) to be attached to an isolator shaft (31), and a pair of plates (22) (preferably comprising an array of panels) attached to the plate arms (21) and separated by a gas space (23), which plates (22) are suitably provided with insulation (27) retained by cladding (28). The blade plates (22) will usually be provided with convolutions (24) to give them improved stiffness, and the blade plates will furthermore be welded or otherwise secured together by means such as a series of short tubes (25) extending therebetween.



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BLADES FOR ISOLATORS

This invention relates to improvements in or relating to blades for isolators, i.e. isolating valves, especially diverter and flap isolators. The invention is particularly concerned with the flap and blade construction (hereinafter referred to as the blade) of large such isolators.

One of the main problems in the design of isolator blades is to provide a structure that can resist the applied loadings due to gas pressure, weight and seal loading, and will also not distort under start-up/shut down temperature transients as well as steady state elevated temperature operating conditions.

In the usual construction the blade assembly consists of a blade arm frame with individual blades attached to it, one for flap isolators, two for diverter valves, the attachment being carried out in such a way that differential movements are possible between the blades and blade arm frame.

A known blade structure is shown in figure 1 of the accompanying drawings, which is an exploded isometric view of a known type of blade structure of a diverter isolator, and which shows a blade arm frame 1, to one

side of which is attached a boiler inlet blade 2 to which is in turn attached an insulation 3 and an insulation cladding 4. To the other side of the blade arm frame 1 is attached a bypass blade 5 to which is in turn attached another insulation 6 and an insulation cladding 7. The blade arm frame 1 itself has a central fixing 8 for the blades and blade location guides 9.

The operating shaft comprises a connecting shaft 10 and, at each end thereof, a stub shaft 11 having a keyed and bolted flange connection 12, a shaft seal 13, a high temperature shaft bearing 14, a coupling 15, and an actuator 16. The actuator 16 has a motor 17, a reduction gear box 18 and bevel gearing 19. There is also a hand wheel 20. It may be noted that the drive motor assembly can be mounted centrally or inboard of actuators over duct as site conditions allow.

Details of the blade structure shown in figure 1 are illustrated in figure 2 of the drawings, wherein figure 2a is a perspective view of the assembled blade structure, and figures 2b, 2c and 2d are detailed perspective views showing the areas indicated A, B and C respectively in figure 2a. Specifically figure 2b shows a clamp arrangement between the various parts of the blade structure, and in particular illustrates the insulation infill 3 and 6, figure 2c shows the centre

location pin structure, and figure 2d shows the guide key structure.

The disadvantage of this type of structure is that overall blade weight is high, leading to high operating torques.

The present invention relates particularly to diverter and flap isolators for high temperature applications.

The present invention provides a blade for an isolator, in particular for a diverter or flap isolator, which comprises a plurality of plate arms to be attached to an isolator shaft, and a pair of plates (preferably comprising an array of panels) attached to the plate arms and separated by a gas space, which plates are suitably provided with insulation retained by cladding, preferably in the form of cladding panels.

The blade plates are of such a width as to fit between the plate arms. They will be made in as long lengths as possible and only joined (by welding) where necessary.

The blade plates, which will be thin plates, will usually be provided with convolutions of some sort to given them improved stiffness. The blade plates will furthermore be welded or otherwise secured together by

means such as a series of short tubes extending therebetween.

The present invention thus provides a one-piece blade which has the effect of reducing the operating torque. A main feature of the design is that all main parts of the blades are wetted by the hot gas at all times.

The blade according to the invention comprises a number of plate arms, the actual number depending upon the operation conditions and size. At the shaft end these are suitably stiffened to increase the section modulus as required. Between each arm two thin plates separated by a gas space are welded to the arms. Depending on the size these skin plates are provided with convolutions to give stiffness in the direction parallel to the shaft and to limit the size of each flat plate area to a roughly square aspect ratio. The blade plates are provided with additional support by means of short tubes protruding through each plate and welded to the plates on the outside. In the same way insulation cladding pins are taken right through each plate and thus provide additional support.

The edges of the skin plate are provided with a special edge section to form the seal mountings. The shape of this edge section is so arranged to allow the greatest

possible contact to the gas. At the edges perpendicular to the shaft the seal edge section is welded to the outside of the outer arms. Between each arm, on each side of the blade, are trays to allow the convenient fitting of thermal insulation, retained by cladding panels. This performs the function not only of reducing the heat transfer across the blade when in the terminal position(s), but also serves to maintain the structural skin at the gas temperature to minimise distortion.

In the terminal positions, as well as in intermediate positions, there is a free gas path through the centre of the blade which allows the whole structure to be kept at the gas temperature at all times, eliminating the risk of distortion.

The invention will be further described by way of example only, with reference to the accompanying drawings, in which:

Figure 3a is a front view of a blade structure according to the present invention;

Figure 3b is a section taken along the line A-A in figure 3a;

Figure 4a is an enlarged side view illustrating the blade structure of figure 3 in more detail and also

illustrating gas flow paths through the blade structure; and

Figure 4b is an enlarged front view showing a detail of the blade structure of figure 3.

The blade structure shown in the drawings comprises a number of plate arms 21, the actual number of arms depending upon the operation conditions and size. At the shaft end these are suitably stiffened to increase the section modulus as required. Between each arm 21 two thin plates 22, separated by a gas space 23, are welded to the arms 21. Depending on the size these skin plates are provided with convolutions 24 to give stiffness in the direction parallel to the isolator shaft and to limit the size of each flat plate area to a roughly square aspect ratio, as shown. The blade plates 22 are provided with additional support by means of short tubes 25 protruding through each plate and welded to the plates on the outside. In the same way insulation cladding pins 26 are taken right through each plate and thus provide additional support. The thin plates 22 are each provided on the outside surface thereof with insulation 27 retained by cladding 28.

The edges of the blade are provided with a special edge section 29 to form the seal mountings. The shape of

this edge section is so arranged to allow the greatest possible contact to the gas. At the edges perpendicular to the shaft the seal edge section is welded to the outside of the outer arms. Between each arm, on each side of the blade are trays to allow the convenient fitting of the thermal insulation 27, retained by the cladding panels 28. This performs the function not only of reducing the heat transfer across the blade when in the terminal position(s), but also serves to maintain the structural skin at the gas temperature to minimise distortion.

The arms 21 are provided with extensions 30 which functions as blade stops.

The isolator shaft itself is indicated by reference numeral 31.

In the terminal positions, as well as in intermediate positions there is a free gas path through the centre of the blade which allows the whole structure to be kept at the gas temperature at all times, eliminating the risk of distortion, as shown by the arrows in figure 4a.

CLAIMS

1. A blade for an isolator, comprising a plurality of plate arms (21) to be attached to an isolator shaft (31), and a pair of plates (22) attached to the plate arms (21) and separated by a gas space (23).

2. A blade as claimed in claim 1, characterized in that the plates (22) comprise an array of panels.

3. A blade as claimed in claim 1 or 2, characterized in that the plates (22) are provided with insulation (27) retained by cladding (28).

4. A blade as claimed in any of claims 1 to 3, characterized in that the plates (22) are provided with convolutions (24).

5. A blade as claimed in any of claims 1 to 4, characterized in that the plates (22) are secured together by means such as short tubes (25) extending therebetween.

6. An isolator, in particular a diverter or flap isolator, which has a blade as claimed in any of claims 1 to 5.

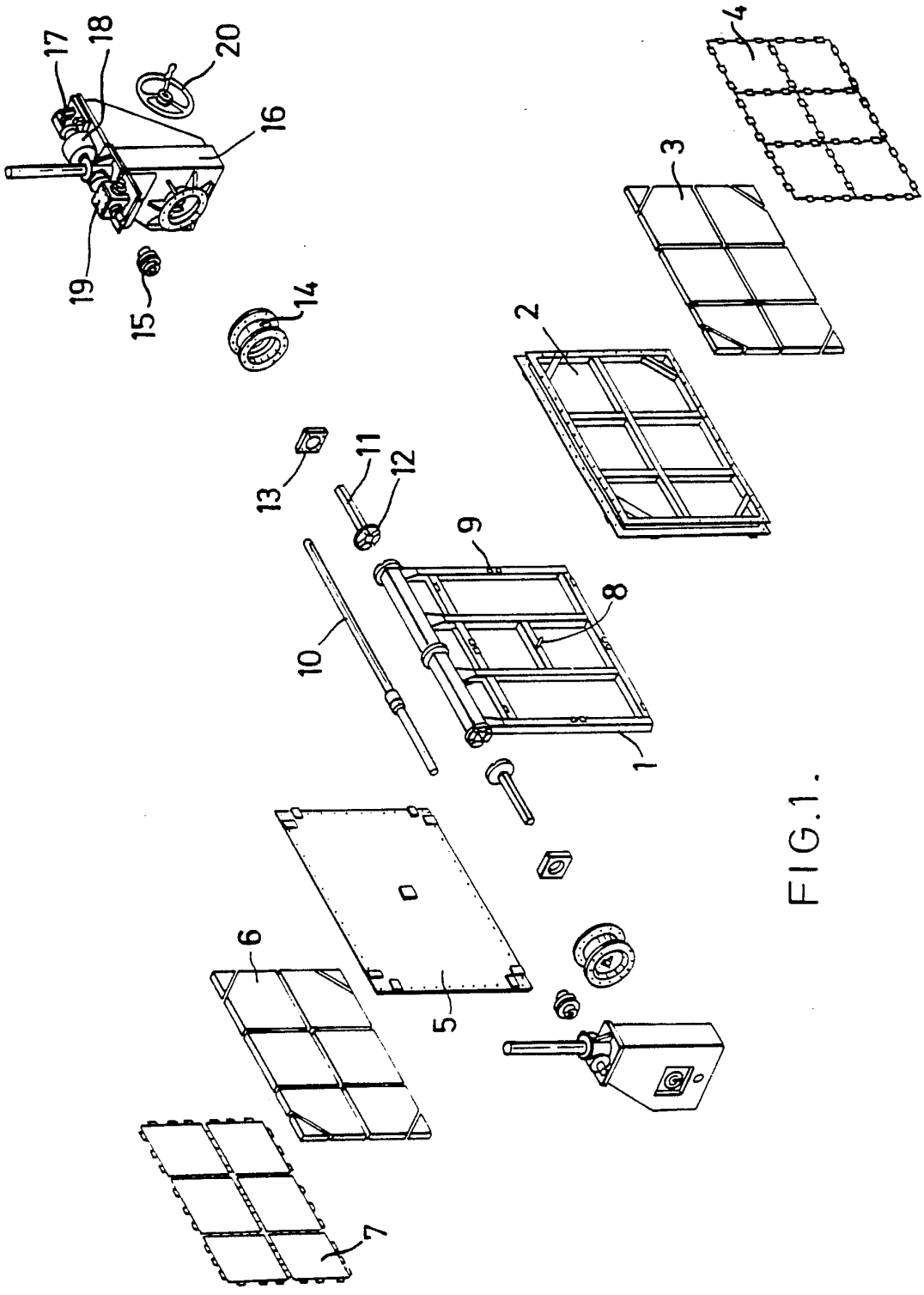

FIG.1.

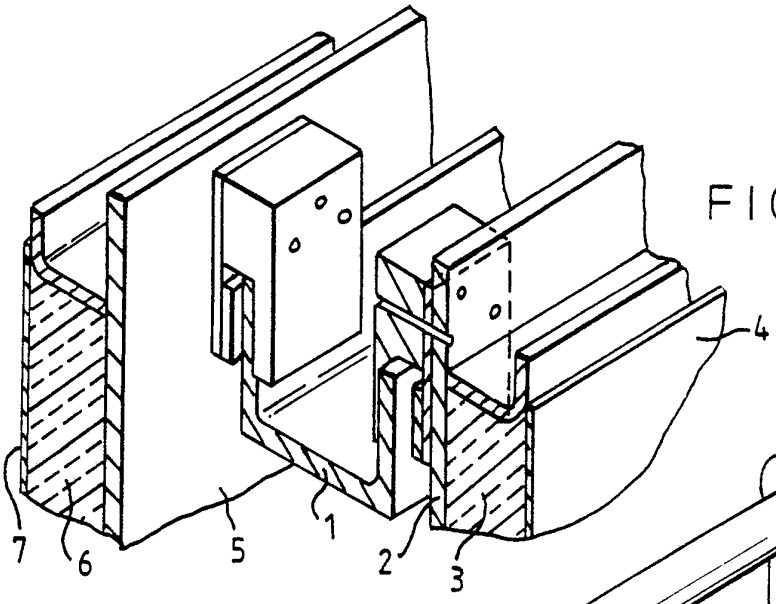

FIG.2b

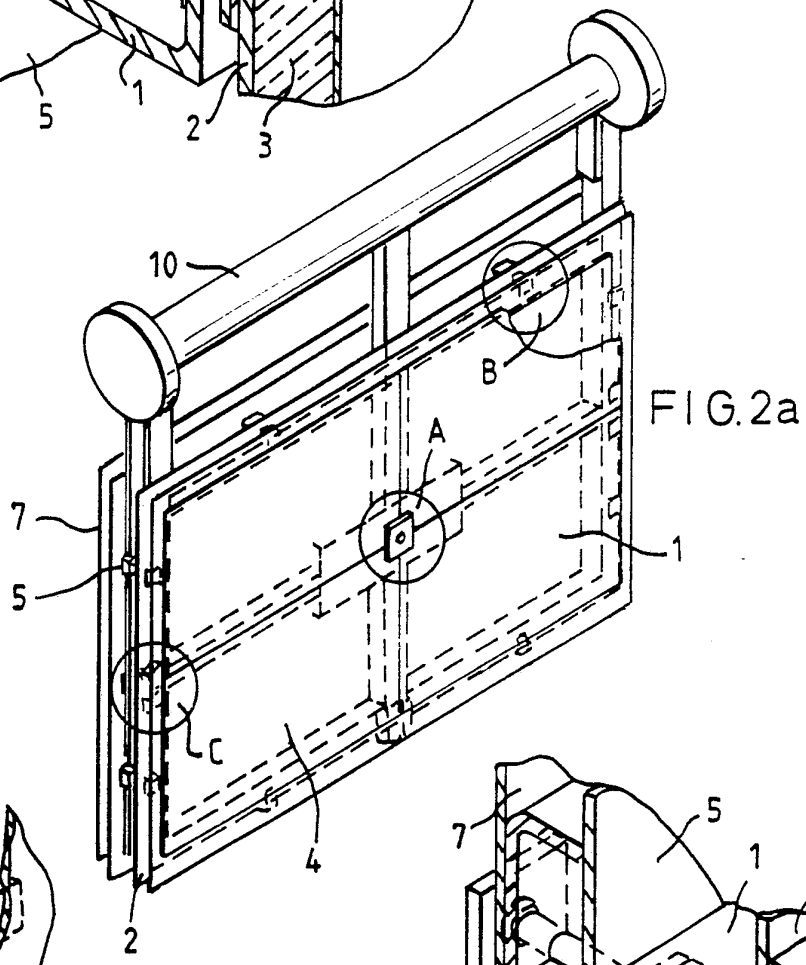

FIG.2a

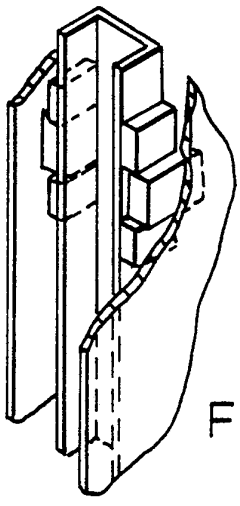

FIG.2d

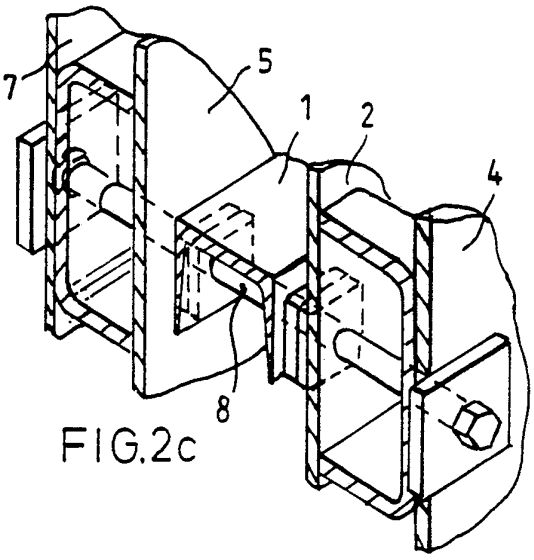

FIG.2c

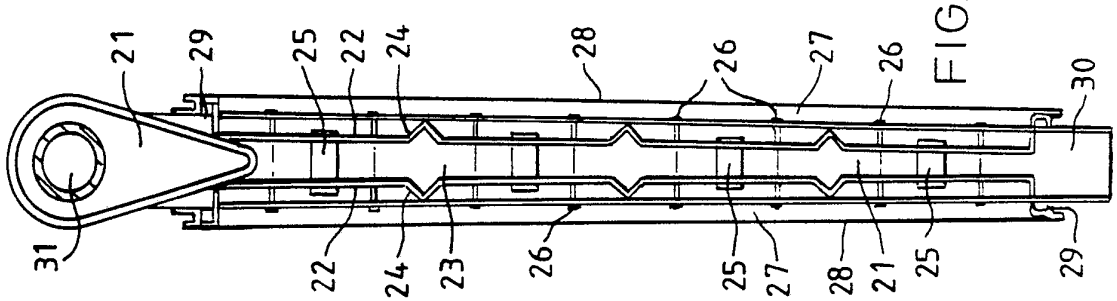
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FIG.3b

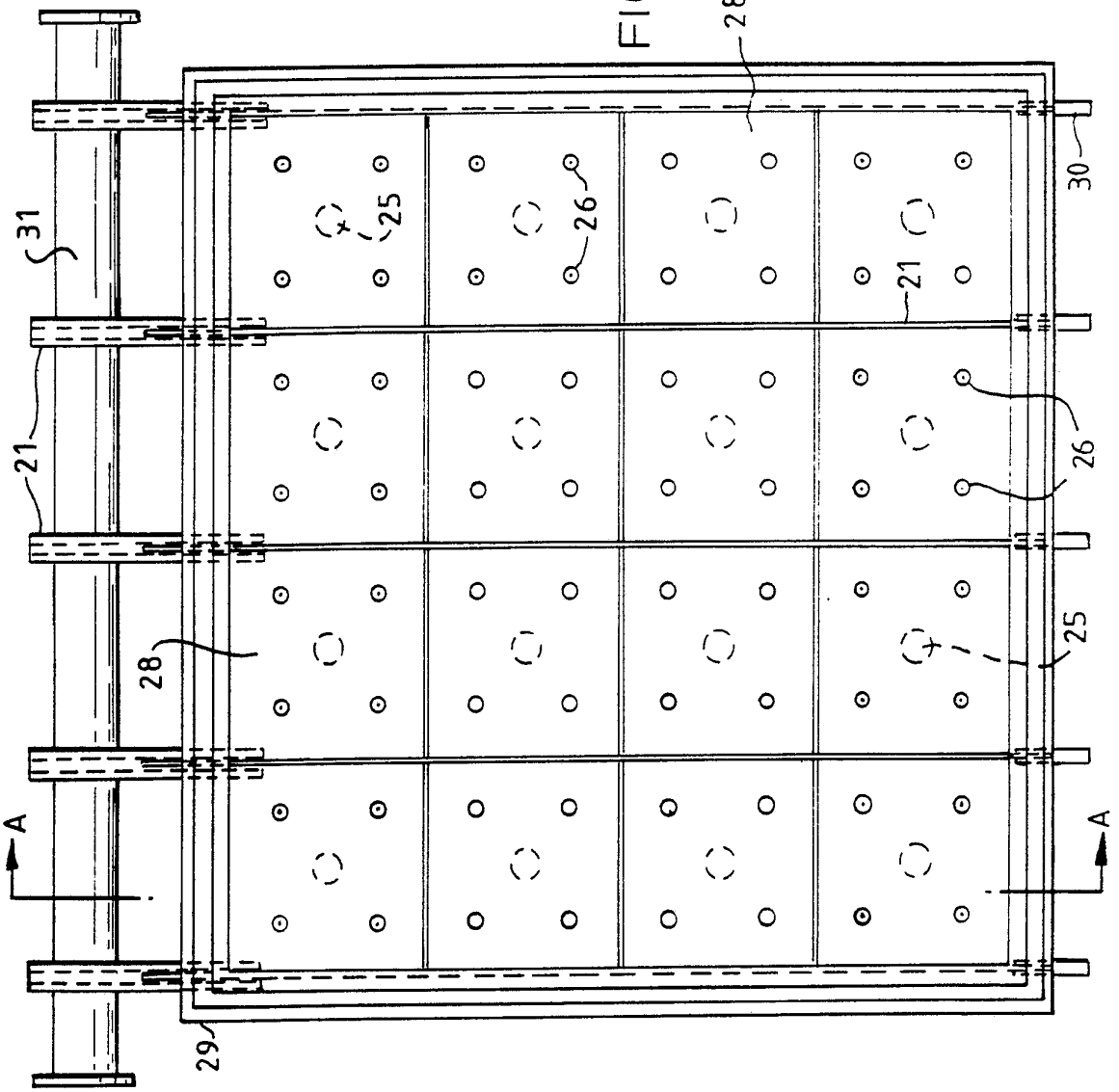
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FIG.3a

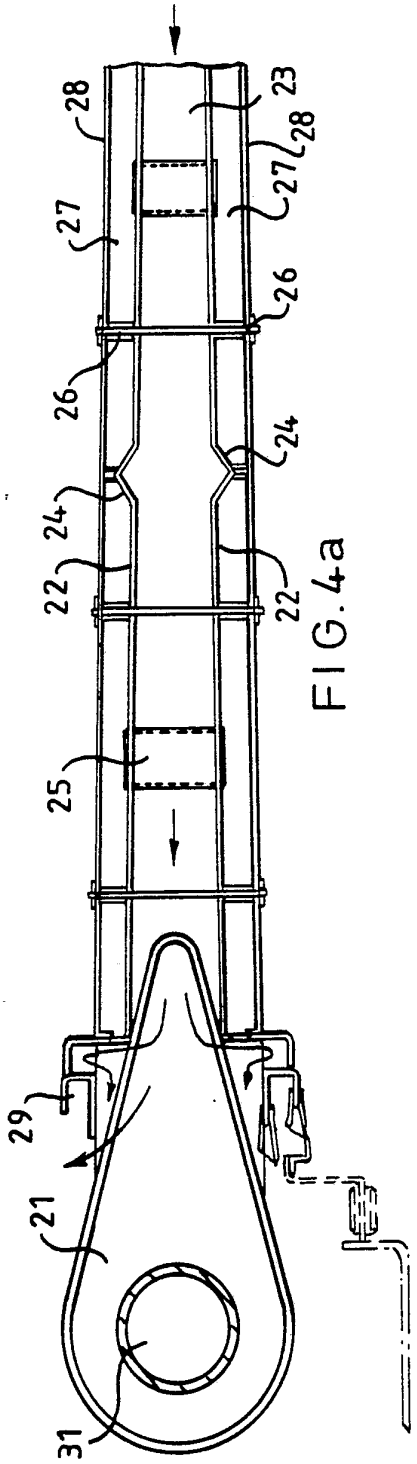

FIG. 4a

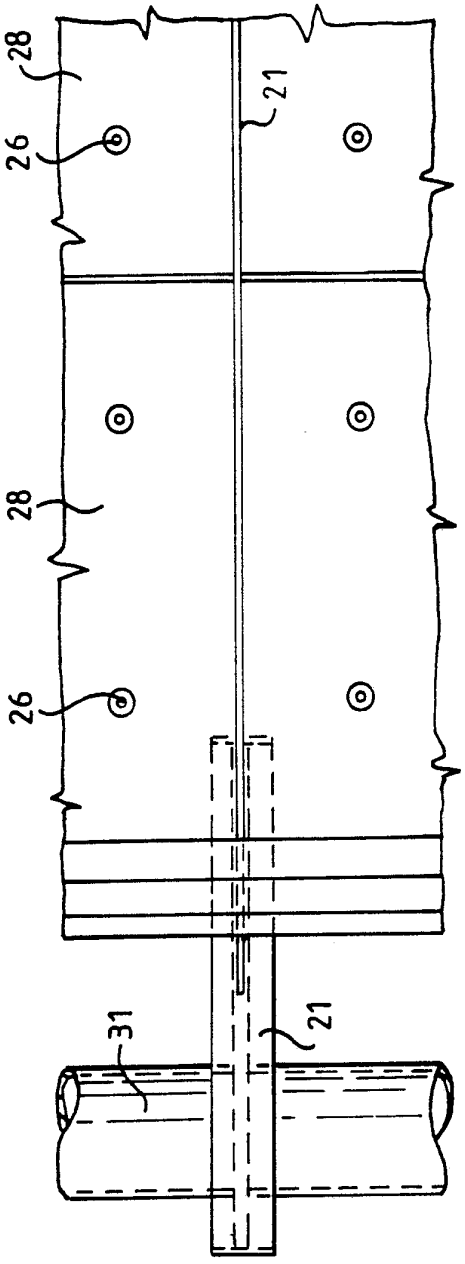

FIG. 4b

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 92/01051

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl.5 F 16 K 1/20

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl.5	F 16 K

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
A	DE,B,1190753 (LOWE) 8 April 1965, see column 7, lines 7-12 ---	1
A	WO,A,9015945 (W. HALLEY) 27 December 1990, see the whole document ---	1
A	WO,A,8809458 (BACHMANN) 1 December 1988, see the whole document ---	1
A	DE,U,8910185 (RAPPOLD) 28 December 1989, see the whole document -----	

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
07-09-1992	06. 10. 92
International Searching Authority	**Signature of Authorized Officer**
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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. GB 9201051 SA 60667

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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