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**Coating system.**

A powder coating system comprises an enclosure (3) with an opening in a base portion thereof. The opening provides communication between the enclosure (3) and an excess powder collection receptacle positioned, in use, below the enclosure. The opening is closed by a vibrating sieve member (7). Excess powder accumulates in the base of the enclosure (3) and is sieved through the sieve member (7) into the collection receptacle.

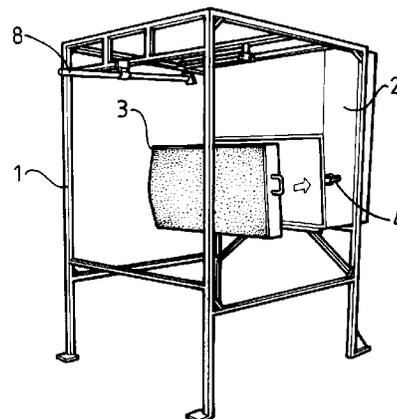


FIG 1

This invention relates to powder coating, and in particular to a powder coating enclosure and system.

Powder coating is widely used for the application of coatings or finishes to a wide variety of articles. Powder coating systems generally comprise an enclosure within which the article to be coated is mounted or suspended. The enclosure serves to prevent escape of powder to the environment. Extraction systems are provided to remove and capture excess powder. These comprise fabric filters, cyclones or reverse jet cartridge filters. In all cases, the spraying process takes place under a reduced pressure generated by the extraction system and the powder-laden air is intercepted at some point external to the enclosure.

All such known systems suffer from certain disadvantages. They are, to varying degrees, mechanically complex. The enclosures require regular cleaning, and very thorough cleaning between uses of powders of differing colours. This results in considerable periods of 'down-time'. The alternative, viz dedicating each system to one colour only, necessitates very considerable capital outlay in the provision of multiple systems which furthermore occupy considerable space.

There has now been devised a powder coating system which overcomes or substantially mitigates these disadvantages.

According to the invention, there is provided a powder coating system comprising an enclosure with an opening in a base portion thereof, said opening providing communication between the enclosure and an excess powder collection receptacle positioned, in use, below the enclosure, said opening being closed by a vibrating sieve member.

The coating system according to the invention is advantageous primarily in that it is of relatively simple construction. Partly for that reason, the proportion of excess powder which is recovered for re-use is very high. In addition, the excess powder is sieved as it passes into the collection receptacle, removing any extraneous material and breaking up any agglomerates.

The enclosure may be of any material which is impermeable to the material being sprayed, eg metal or plastics material. However, it is particularly preferred that the enclosure should be of flexible material such that the enclosure is capable of being folded up. This enables the enclosure to be removed from the system and folded away, and then replaced by another enclosure dedicated to spraying of powder of a different colour. In this way, the problems of cleaning associated with conventional coating systems prior to colour change are overcome. When the colour of the powder being sprayed is to be changed, all that has to be done is detach and fold away the enclosure, and replace it with the enclosure used for the new colour. Changing the enclosure therefore takes only a few minutes, and

when folded away the previous enclosure occupies very little space.

As an alternative to folding of the enclosure, it may be preferable, particularly for larger-sized enclosures, to store the enclosures in an unfolded condition, eg suspended from a rack. The rack may then be stored in a suitable enclosure.

It may be preferable to store enclosures which are not in use in units with low-temperature heating. This has been found to maintain the enclosure and filter in optimal condition.

Suitable flexible materials for the enclosure are fabrics. It is particularly preferred that the enclosure should be of a fabric which is resistant to the build-up of static charge. An example is fabric which incorporates carbon fibre threads which earth the surface of the fabric. Such fabric is commercially available and is used, for example, in the manufacture of clothing used in environments where build-up of static charge would be hazardous, eg on oilfield installations. Provision is preferably made for good earthing connection of the enclosure to its surroundings. The fabric may also be coated with materials such as PTFE to facilitate cleaning and to reduce any tendency for powder to build up on the internal walls of the enclosure. The enclosure may be manufactured in the desired shape by conventional stitching or welding.

In another embodiment, the enclosure may be of a material such as paper, and simply be disposed of after use. In other cases, particularly where the system is used only for a single colour, the enclosure may be partly of a rigid material such as steel, with only part, eg just the base, being flexible.

A flexible enclosure will generally be supported on an external framework. Suitable means are therefore provided on the enclosure for connection to the framework in such a way that the enclosure is stretched to its desired configuration. The enclosure is also provided with various apertures and/or windows for introduction of the article to be coated and the powder spray, and for viewing or illumination. Any such apertures can preferably be closed off by suitable fasteners, eg zip fasteners, ties or touch-and-close (VELCRO-type) fasteners.

Vibrating motion may be imparted to the sieve member by an external vibrator unit of generally conventional construction. The sieve member and vibrator mechanism may be dedicated to the enclosure, or may be detachable therefrom so as to be useable with each of a range of enclosures.

In use, a receptacle for sieved powder is located below the vibrating sieve member. The sieve member may be connectable, either directly or via a suitable adapter, to a conventional powder box as delivered by the powder manufacturer, or to a proprietary powder container. This directs the sieved powder directly to a receptacle in which it may be stored and re-used.

The receptacle into which the sieved powder falls

may be provided with means for automatically returning the powder to the gun used to spray the powder into the enclosure.

An article to be coated is suspended or mounted within the enclosure, and may be positioned either manually or using a conveyor. The conveyor may be a dead end in-and-out conveyor or a through conveyor.

Air is preferably drawn through the enclosure by an extraction unit fitted to the support framework. This draws air through a filter, taking with it any excess powder which has not fallen to the sieve. The filter preferably forms part of the enclosure so that the extraction unit is on the clean side of the filter. In this way, excess powder and other contaminants are retained in the enclosure. The extracted air may be vented directly back into the immediate environment, eliminating the need for any permanent ductwork system.

Preferably, the extraction unit operates intermittently or periodically to reverse the flow of air through the filter, thereby dislodging accumulated contaminate and allowing it to fall to the sieve. Reversal of the air flow may take place at regular intervals or may be triggered by a sensed fall in throughput.

As an alternative, in heavy duty processes the filter may be cleaned by an air knife connected to a mechanism which draws the air knife across the back of the filter. The air knife may be powered by a high pressure fan or compressed air and imparts a cleaning action from the back of the filter over a narrow strip, lifting powder from the filter and discharging it into the base of the booth.

According to a preferred aspect of the invention, there is thus provided a powder coating system comprising a support frame on which is mounted an extraction unit, a flexible enclosure supported on the frame, a wall of the enclosure incorporating a filter panel adapted for connection to the extraction system, and the enclosure having an opening at a base portion thereof, which opening is closed by a sieve member, means for imparting vibratory motion to said sieve member, and an excess powder receptacle positioned below said sieve member.

According to another aspect of the invention, there is provided a flexible enclosure for use in a powder coating system as defined above, a wall of the enclosure incorporating a filter panel, and the enclosure having an opening at a base portion thereof, which opening is closed by a sieve member.

The invention will now be described in greater detail, by way of illustration only, with reference to the accompanying drawings, in which

Figure 1 is a perspective view of coating system according to the invention, showing how a folded enclosure is fitted to a support unit prior to use; Figure 2 is a perspective view of the system of Figure 1, with the enclosure in the operating position;

Figure 3 is a view in side elevation of the coating system as shown in Figure 2;

Figure 4 is a view in front elevation of the coating system as shown in Figure 2; and

Figure 5 shows the steps in the removal of the enclosure from the coating system of Figure 2.

Referring first to Figure 1, a powder coating system comprises a tubular steel support framework 1 on the back of which is mounted an extractor unit 2. An enclosure pack 3 is fitted to the extractor unit 2 and secured by means of catches 4. The face of the enclosure pack 3 which is offered up to the extractor unit 2 is a rectangular filter panel which forms part of the rear wall of the assembled enclosure. The enclosure is formed from anti-static fabric.

The enclosure is unfolded from the pack 3 and secured to the framework 1 by flexible ties such that it adopts the configuration shown in Figure 2. The enclosure has a frontal opening 5 and a transparent window 6 in its roof. A door panel is provided for the frontal opening 5. After assembly of the enclosure, the door panel is rolled down and secured by ties, leaving the frontal opening 5 open as shown in Figure 2. The base of the enclosure has a central opening to which is clamped a circular sieve 7. A support rod 8 is fitted to the front of the framework 1 and extends into the frontal opening 5.

In use, a suitable receptacle (not shown) is fitted to the underside of the sieve 7, and the sieve is connected to a vibrator unit. The extractor unit 2 is switched on and air is drawn into the enclosure through the frontal opening 5 and out through the filter panel in the rear wall of the enclosure. An article to be coated is suspended from the support rod 8 and powder is sprayed into the enclosure through the frontal opening 5. Excess powder falls under gravity to the base of the enclosure where it is sieved into the receptacle. Any powder entrained in the airflow through the enclosure accumulates on the filter panel. When this accumulation causes a detectable fall in airflow through the filter panel, the extractor unit 2 automatically reverses, thereby dislodging the accumulated powder. The vibratory motion of the sieve 7 is transmitted to the whole of the enclosure and this inhibits any accumulation of powder on the internal surfaces of the enclosure.

Each enclosure pack 3 is dedicated to spraying of powder of one colour. If it is desired to spray a different colour, the enclosure pack is changed. This is done by closing the door panel of the frontal opening 5, disconnecting the receptacle from the sieve 7, and folding the enclosure as shown in Figure 5. For clarity, the framework 1 is omitted from Figure 5. The front top edge of the enclosure is disconnected from the framework 1 and folded down to the bottom rear edge (Figure 5a). The top rear edge is disconnected and folded down over the filter panel (Figure 5b). The bot-

tom front edge is disconnected and folded up over the filter panel (Figure 5c). Finally, the enclosure pack 3 is released from the extraction unit 2 and the lower edge folded upwards (Figure 5d). The new enclosure pack is fitted by the reverse of this series of operations.

### Claims

1. A powder coating system comprising an enclosure (3) with an opening in a base portion thereof, said opening providing communication between the enclosure (3) and an excess powder collection receptacle positioned, in use, below the enclosure, said opening being closed by a vibrating sieve member (7). 10
2. A system as claimed in Claim 1, wherein the enclosure (3) is of flexible material such that the enclosure is capable of being folded up. 15
3. A system as claimed in Claim 2, wherein the flexible material is a fabric. 20
4. A system as claimed in Claim 3, wherein the fabric is resistant to the build-up of static charge. 25
5. A system as claimed in Claim 4, wherein the fabric incorporates carbon fibre threads which earth the surface of the fabric. 30
6. A system as claimed in any one of Claims 3 to 5, wherein the fabric is coated with a material which reduces any tendency for powder to build up on the internal walls of the enclosure. 35
7. A system as claimed in Claim 2, wherein the enclosure is a disposable enclosure made of paper. 40
8. A system as claimed in Claim 1, wherein the enclosure is partly of a rigid material and partly of a flexible material. 45
9. A system as claimed in any preceding claim, further comprising an external framework (1) on which the enclosure (2) is supported.
10. A system as claimed in any preceding claim, wherein a receptacle for sieved powder is provided below the vibrating sieve member (7). 50
11. A system as claimed in any preceding claim, further comprising an extraction unit (2) by which air is drawn through the enclosure (3). 55
12. A system as claimed in Claim 11, wherein the ex-

traction unit (2) draws air through a filter which forms part of the enclosure (3).

13. A system as claimed in Claim 12, wherein the extraction unit (2) operates intermittently or periodically to reverse the flow of air through the filter.
14. A flexible enclosure for use in a powder coating system as claimed in Claim 1, a wall of the enclosure incorporating a filter panel, and the enclosure having an opening at a base portion thereof, which opening is closed by a sieve member.

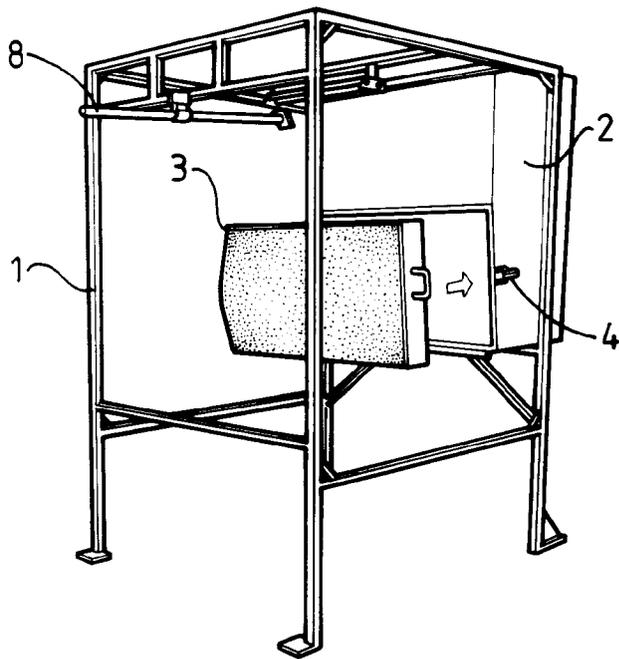


FIG 1

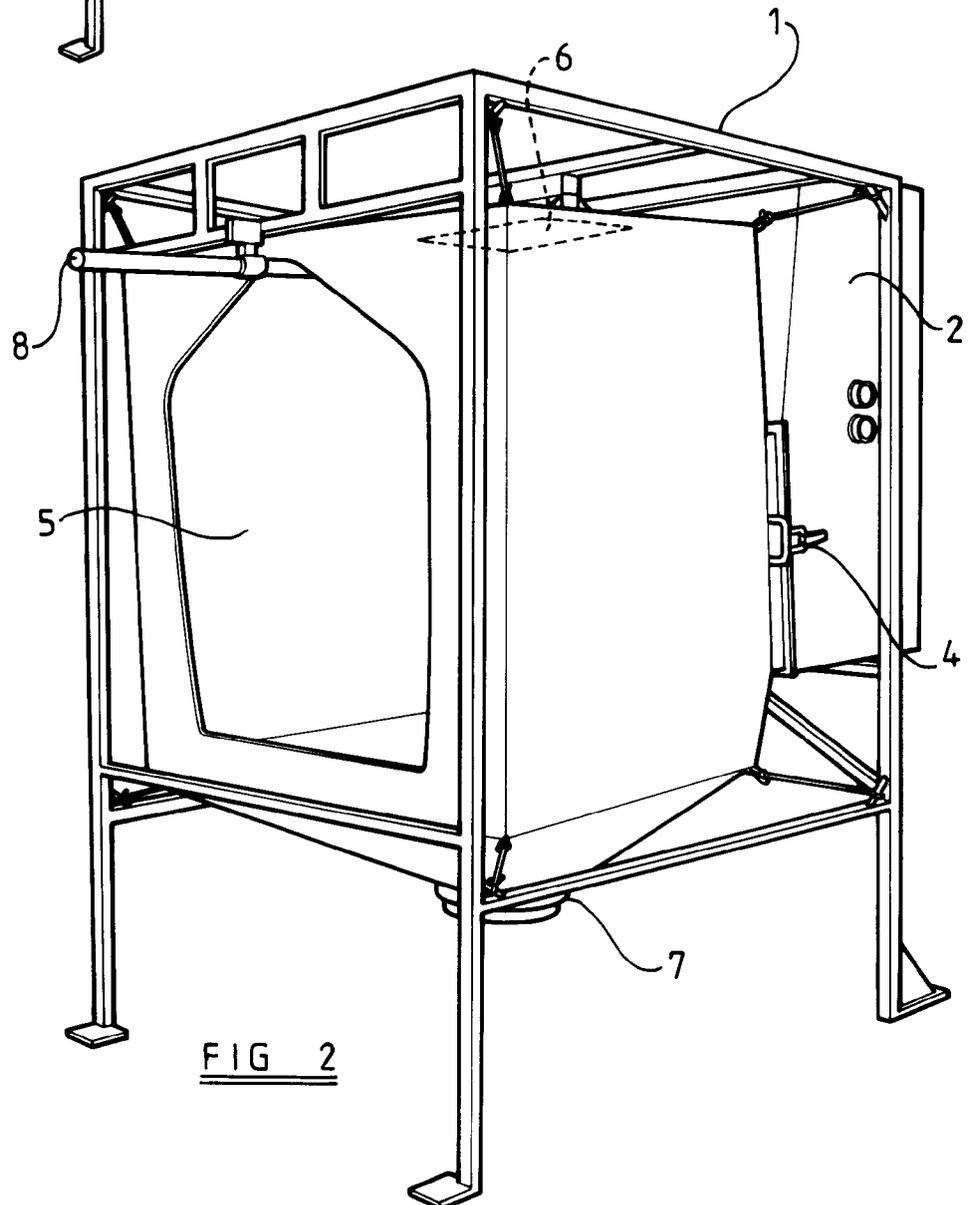
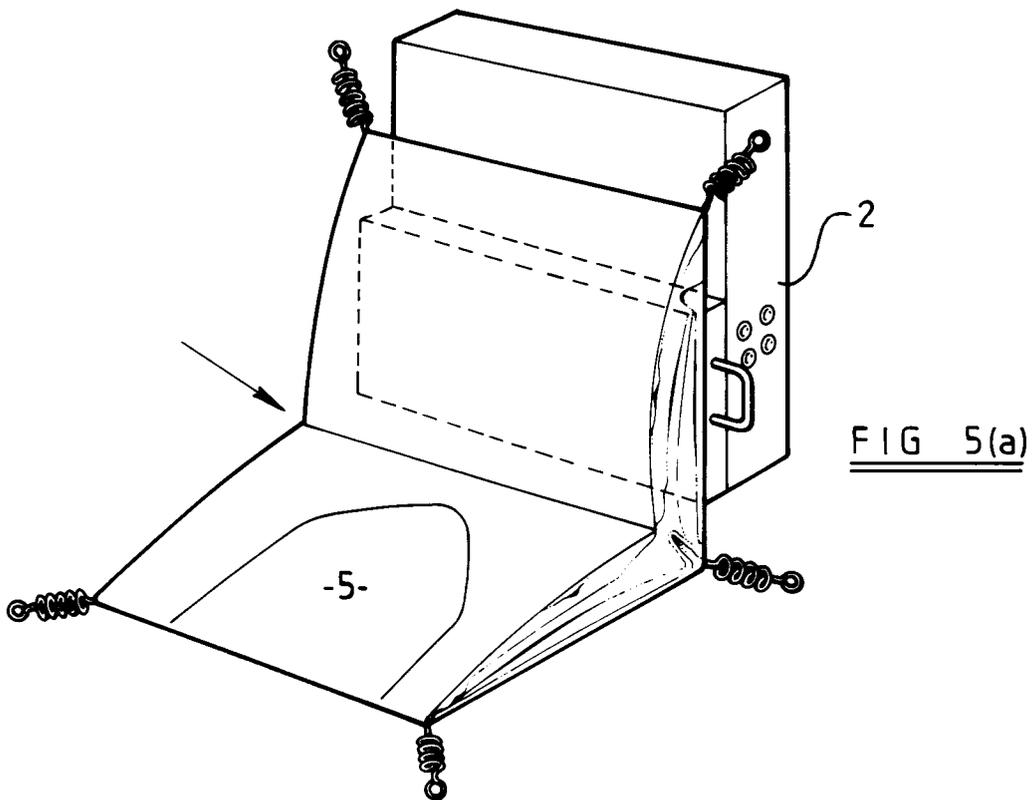
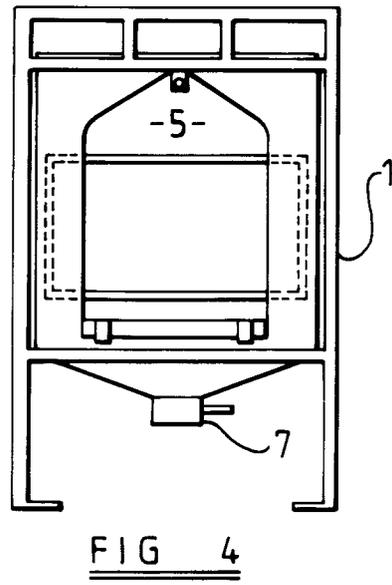
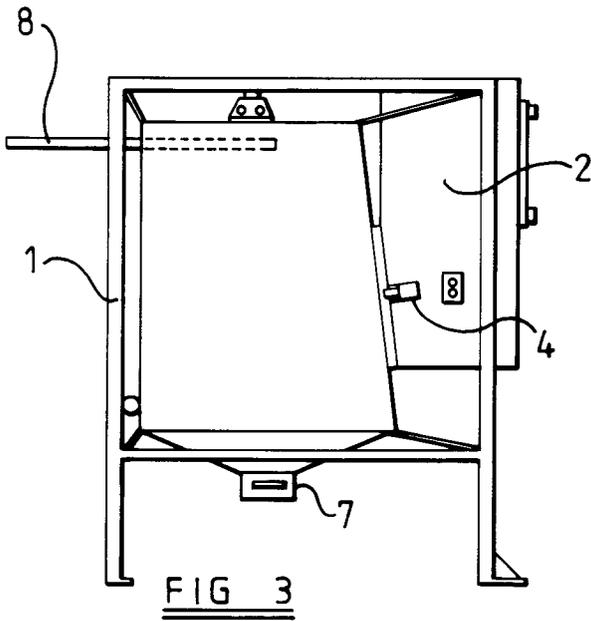
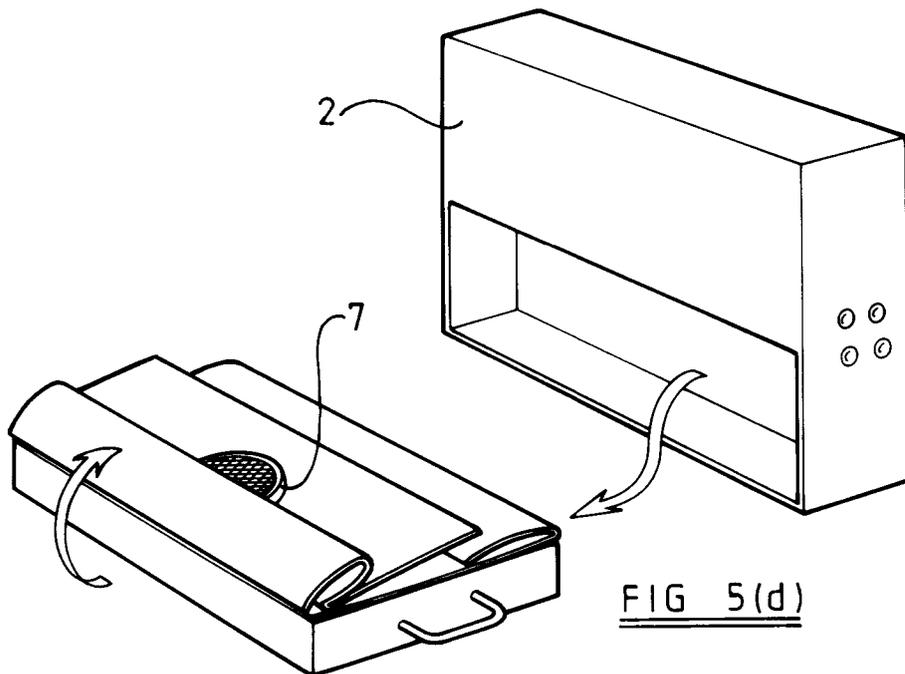
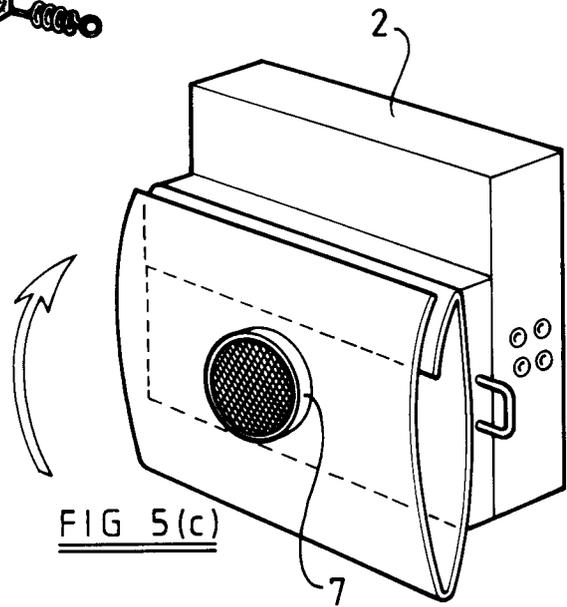
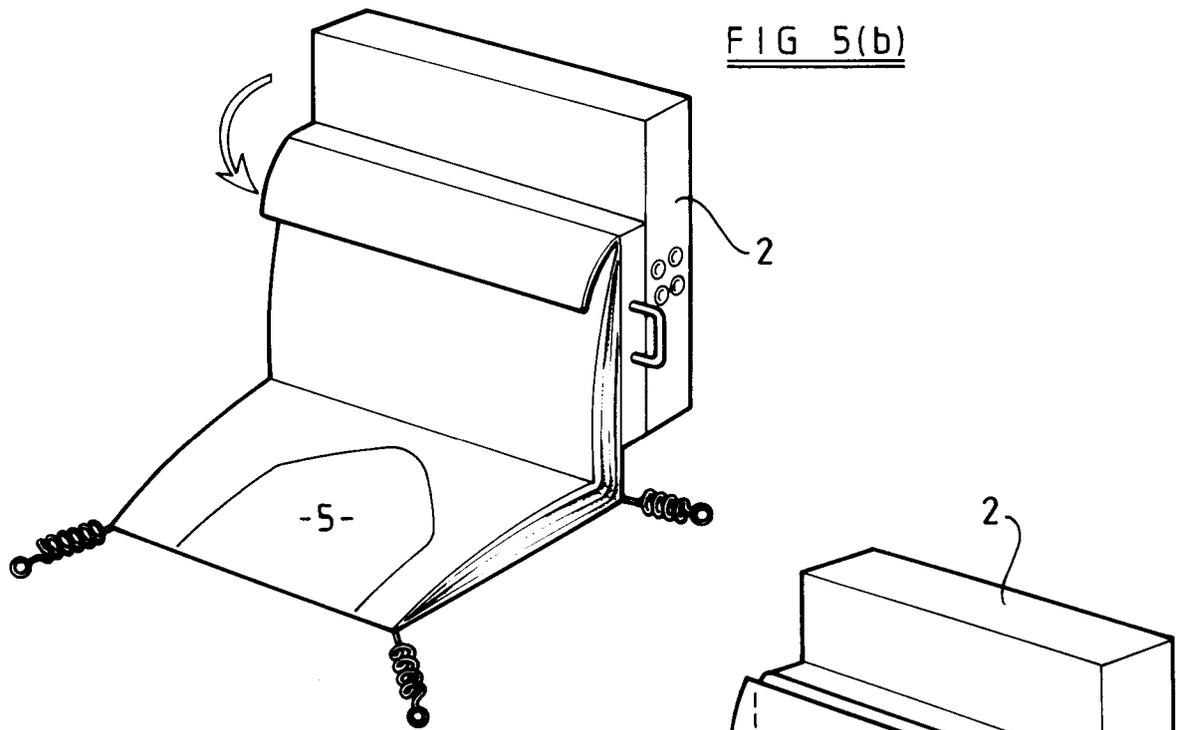


FIG 2







European Patent  
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EUROPEAN SEARCH REPORT

Application Number  
EP 94 30 0928

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	DD-A-270 476 (VEB INFRAROT-ANLAGEN)	1,10	B05B15/12
Y	* page 10 - page 11; figure 1 *	2,9,11	
Y	EP-A-0 375 511 (SAMES S.A.)	2,9,11	
A	* the whole document *	3-6,8, 12,14	
A	US-A-3 315 639 (G.M. CLOSE)	8	
A	* the whole document *		
A	US-A-4 760 951 (MAC GREGOR)	7,8	
	* the whole document *		
A	WO-A-89 02788 (H. MOLDOW A/S)	1-3,7-9, 11,12	
	* abstract; figure 1 *		
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		25 April 1994	Guastavino, L
<b>CATEGORY OF CITED DOCUMENTS</b> 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			

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