



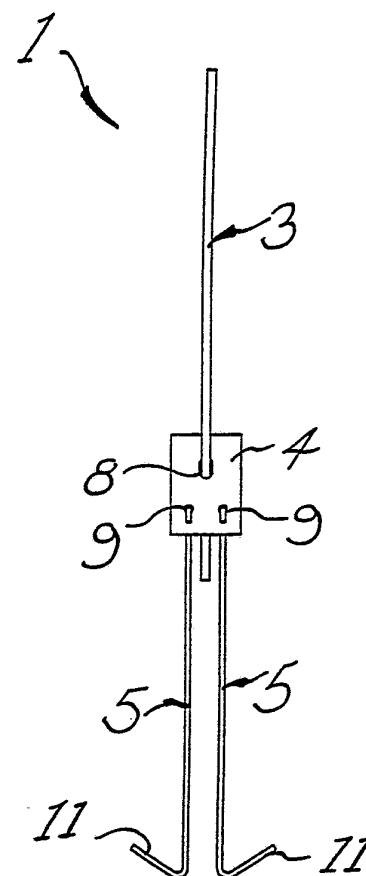
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/AU91/00007 (22) International Filing Date: 7 January 1991 (07.01.91) (30) Priority data: PJ 8303 19 January 1990 (19.01.90) AU (71)(72) Applicant and Inventor: CURTIS, Christopher, John [AU/AU]; 13 Kallaroo Road, Lane Cove, NSW 2066 (AU). (74) Agent: SHELSTON WATERS; 55 Clarence Street, Sydney, NSW 2000 (AU). (81) Designated States: AU, DE, GB, US.</p>		<p>Published <i>With international search report.</i></p>

(54) Title: SUSPENDED CEILING SYSTEM

(57) Abstract

A hanger (1) for suspension of ceiling panels (2) comprising, a hanger member (3) adapted to be fixed adjacent one end, an adjustment plate (4) selectively engageable with said hanger member (3) at a selected distance from the fixed end, and a pair of support hooks (5) depending from said adjustment plate (4) to respectively engage adjacent ceiling panels (2), said hooks (5) being attached to said adjustment plate (4) by means of a shank (10) passing through an aperture (9) in the adjustment plate (4), said shank (10) terminating at its end proximal to said plate (4) in a stop (12) of larger dimension than said aperture (9), and being moveable between a lowered position in which said stop (12) abuts said adjustment plate (4) and a raised position by movement of said shank (10) through said aperture (9).



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"SUSPENDED CEILING SYSTEM"

TECHNICAL FIELD

This invention relates to suspended ceilings.

The invention has been developed primarily for use in commercial buildings. However, it will be appreciated that the invention is not limited to this field of use.

BACKGROUND ART

In modern office buildings the ceiling has several functions. In addition to covering the building surfaces such as plumbing, air conditioning duct work and electrical wiring under the concrete floor slab or roof above, it often supports the lighting fixtures which illuminate the space below. In large open office areas this may be the only way to support these fixtures.

The ceiling also serves to absorb much of the sound generated in office by the people and machines in order to reduce the overall noise level.

Thermal insulation may also be provided by, or in

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combination with, the ceiling structure. Alternatively the insulation may be provided behind and remote from the ceiling itself.

Apart from its functional properties, the ceiling together with the floor and walls defines the aesthetic appearance of the office.

Ceiling systems used in commercial buildings must satisfy local government regulations and various Australian Standards, in particular AS2785 - Suspended Ceilings - Design and Installation. It must also satisfy fire safety standards and may be required to have a fire resistance rating in combination with the floor slabs.

Ceiling systems hitherto have mostly comprised steel rods fixed to the floor slab above which support a horizontal grid of light weight supporting members which in turn support a plurality of ceiling panels. Typically these panels are 600 mm wide and 1200 mm long made from a variety of materials, the most common being gypsum plaster or the like.

In general these systems are either very expensive or conversely if lower priced they are often difficult to fit and maintain. They are not usually as easy to renovate as for example floors and walls and are liable to damage when repeatedly moved for access to the services in the ceiling space above. In addition such systems cannot be readily individually decorated to

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change the aesthetic appearance of the office and often their acoustic and thermal performance is inadequate.

It is an object of this invention to provide a suspended ceiling which will overcome, or substantially ameliorate one or more of the foregoing disadvantages.

DISCLOSURE OF INVENTION

According to a first aspect the invention consists in a hanger for suspension of ceiling panels comprising, a hanger member adapted to be fixed adjacent one end, an adjustment plate selectively engagable with said hanger member at a selected distance from the fixed end, and a pair of support hooks depending from said adjustment plate to respectively engage adjacent ceiling panels, said hooks being attached to said adjustment plate by means of a shank passing through an aperture in the adjustment plate, said shank terminating at its end proximal to said plate in a stop of larger dimension than said aperture, and being moveable between a lowered position in which said stop abuts said adjustment plate and a raised position by movement of said shank through said aperture.

Preferably said hanger member is a rod and the adjustment plate is adapted for selective frictional engagement with a straight portion of the rod and is selectively releasable to slide along said straight portion to effect height adjustment of said ceiling panels.

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According to a second aspect the invention consists in a ceiling panel comprising, a perforate structural sheet, a spaced apart layer of plyable material covering one surface of said sheet, and means to tension said spaced apart layer.

Preferably the ceiling panel includes two protruding edge ribs extending outwards over which the spaced apart layer of material is tensioned.

In preference, thermal and/or acoustic insulation material is included adjacent the remote surface of said structural sheet. If it is preferred that the insulation be remote from said panels, it can be advantageous to include a dust cover adjacent the remote surface of the perforated structural sheet.

Preferably also said panel includes two parallel side flanges. In a preferred embodiment the distal ends of the flanges terminate in an inwardly directed lip.

Preferably said flanges include apertures adapted to receive the aforementioned support hooks for suspension of the panels. It is necessary then that the flanges are angled inwards to allow access to the support hooks such that adjacent panels rest in edge to edge abutment in the lowered position.

Preferably said means to tension the spaced apart layer comprises a splined or serrated rod disposed within the lip.

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Preferred embodiments of the invention therefore provide an easily adjustable hanger system from which custom ceiling panels are suspended.

The panel construction is modular to allow use of a variety of interchangeable coverings and insulation materials as required.

One embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a schematic side view of the ceiling hanger according to a first aspect of the invention with sectional part views of the panels according to a second aspect of the invention, showing one panel in the lowered position and an adjacent panel in the raised position.

Figure 2 is a schematic side elevation of the hanger according to a first aspect of the invention.

Figure 3 is a schematic end elevation of the hanger shown in Figure 2.

Figure 4 is a schematic sectional transverse view of the panel according to the invention.

Figure 5 is an exploded view of the detail 5 shown in Figure 4.

Figure 6 is a schematic side elevation of the invention as shown in Figure 1 wherein one of the panels has been unhooked on one side and is hanging in the

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vertical position.

BEST MODE FOR CARRYING OUT THE INVENTION

Figure 1 shows a hanger 1 supporting two adjacent ceiling panels 2, one illustrated in the lowered position and the other in the raised position.

Referring now to Figures 2 and 3, hanger 1 comprises a hanger member in the form of a rod 3 attached to an adjustment plate 4 from which two support hooks 5 depend. Rod 3 comprises an upper portion 6 and a lower portion 7. The upper portion 6 has at its free end fixing means (not shown) for attachment of the rod to the building structure or an intermediate member fixed thereto.

The lower portion 7 slidably engages the adjustment plate 4 by passing through a slotted aperture 8 as shown.

Adjustment plate 4 has two additional adjacent apertures 9 from which the support hooks 5 are hung.

The support hooks 5 according to this particular embodiment each comprise a shank 10 having at the lowermost end a panel engagement hook 11. At the other end of the shank 10 a smaller plate engagement hook 12 is provided to act as a stop against adjustment plate 4.

Slot 8 must be sized such that when the load is removed from support hooks 5 slight tilting of plate 4 toward the horizontal position will enable it to slide freely along the straight portion 7 of rod 3 to effect infinitely variable height adjustment along the length

of the straight portion.

Similarly apertures 9 should provide adequate clearance on shanks 10 and hooks 5 to allow free sliding of shank 10 as illustrated in Figure 1.

Referring to Figures 4 and 5 there are shown sectional transverse views of the ceiling panel according to a second aspect of the invention.

The panel 2 comprises a perforated steel structural sheet 15, a layer of fabric 16 attached to the external surface thereof and a thermal and acoustic insulation material 17 adjacent the remote surface of the steel sheet 15.

The perforated steel sheet 15 is roll formed to provide a rectangular tray approximately 1m wide and from 1m to 8m in length. The tray 15 has 2 edge ribs 18 which in turn define a recess 19 in the outer surface. Two integral side flanges 20 are provided which terminate at their free end in an inwardly and downwardly directed lip 21.

The side flanges 20 are formed by rolling the edges of the sheet through an angle in excess of 90° such that they are angled slightly inwards at their free end. Apertures (not shown) are provided at suitable locations in side flanges 20 for engagement of the panels 2 with the aforementioned panel hooks 11 forming part of the hanger 1. The inwardly angled side panels 20 thereby

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allow access to the support hooks 5 such that when adjacent panels are suspended they can rest in mutual unobstructed edge to edge abutment.

At least one serrated splined rod 22 is provided within a lip 21 for tensioning and securing the fabric 16.

This system allows great flexibility in the selected finish of the panels and allows this to be changed quite simply if and when required.

Depending on the application it may be advantageous to incorporate the insulation material 17 with the panel as shown.

In use the hangers 1 as illustrated in the drawings are secured from end portions 6 by appropriate means to the underside of the roof of the building structure. The panels are then systematically attached to the support hooks 5 and the adjustment plate 4 can be moved with relative ease to ensure a level ceiling results.

In the event that any of the services located above the panels need to be accessed, the panel adjacent the relevant area is simply raised by pushing up the panel 2, the shank of the support hook passing up through the adjustment plate as shown in Figure 1.

Access is thus gained to the support hook 5 holding the adjacent panel 2 and this can be released from one side allowing the panel 2 to drop and hang in the vertical position as shown in Figure 6. When the work

is completed the panel is reattached. This feature is particularly useful when repairing light fittings attached to the panel. Unlike many existing systems any panel can be removed with relative ease without the need to work systematically from one corner for example.

The panels themselves confer a great many advantages over the existing prior art. The method of construction of the panel by roll forming from a sheet material enables the panels to be made in a wide variety of shapes and sizes.

The ribs 18 and corresponding indent 19 serves a multitude of purposes. The ribs provide rigidity to the panel structure as a whole enabling each panel to span long distances without additional support. The large panel size that is possible with this system further allows architects and decorators more design freedom as there are fewer panel joints to affect the appearance of the ceiling.

The use of perforated steel sheet is to allow sound to pass through the fabric and the metal tray to be absorbed in a layer of insulation lying in the top of the panel. It is believed that the air space provided between the cloth and the panel further contributes to the acoustic insulation.

In addition the recess serves to hide any deformities and burrs in the perforated metal sheet that

may exist and by tensioning the fabric across the ribs a flat and even surface is always ensured. Further, when the panels are constantly manhandled any slight bending of the panel which may occur will not affect the appearance of the underside of the panel. Overall a more durable panel results than for example those made of gyprock.

Instead of perforating the metal sheet which may be wasteful of material it can be slit and expanded to form a matrix in the manner well known to those skilled in the art.

Similarly the hanger as described incorporates an adjustment system which relies on frictional engagement between the rod and the adjustment plate as this is a simple and effective method of effecting a height adjustment. However it will be appreciated that this method of adjustment can be replaced by known, though less desirable means for example comprising a threaded bar with adjustable locknut which can position and support the hanger plate as required.

In summary the foregoing describes only one embodiment of this invention and modifications can be made thereto without departing from the scope of the invention.

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CLAIMS

1. A hanger for suspension of ceiling panels comprising, a hanger member adapted to be fixed adjacent one end, an adjustment plate selectively engagable with said hanger member at a selected distance from the fixed end, and a pair of support hooks depending from said adjustment plate to respectively engage adjacent ceiling panels, said hooks being attached to said adjustment plate by means of a shank passing through an aperture in the adjustment plate, said shank terminating at its end proximal to said plate in a stop of larger dimension than said aperture, and being moveable between a lowered position in which said stop abuts said adjustments plate and a raised position by movement of said shank through said aperture.
2. A hanger according to Claim 1 wherein said hanger member is a rod and the adjustment plate is adapted for selective frictional engagement with a straight portion of the rod and is selectively releaseable to slide along said straight portion to effect height adjustment of the ceiling panels.
3. A ceiling panel comprising, a perforate structural sheet, a spaced apart layer of pliable material covering one surface of said sheet, and means to tension said spaced apart layer.
4. A ceiling panel according to Claim 2 including two protruding edge ribs extending outwards over which the

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spaced apart material is tensioned.

5. A ceiling panel according to Claim 3 or Claim 4 wherein insulation material is included adjacent the remote surface of said structural sheet.

6. A ceiling panel according to Claim 5 including a dust cover intermediate the insulation material and the remote surface of the perforated structural sheet.

7. A ceiling panel according to any one of Claims 2 to Claim 6 including two parallel side flanges.

8. A ceiling panel according to Claim 7 wherein the distal ends of the flanges terminate in an inwardly directed lip.

9. A ceiling panel according to Claim 7 or Claim 8 wherein said flanges include apertures adapted to receive support hooks for suspension of the panels.

10. A ceiling panel according to Claim 9 wherein the side flanges are angled inwards to allow access of the support hooks such that adjacent panels may rest in one plane in edge to edge abutment.

11. A ceiling panel according to any one of Claims 3 to Claim 10 wherein said means to tension the spaced apart layer comprises a splined or serrated rod disposed within the lip.

12. A suspended ceiling system comprising a hanger according to Claim 1 or Claim 2 in combination with a ceiling panel according to any one of Claims 3 to claim 11.

13. A hanger substantially as herein described with

reference to Figures 1, 2, 3 and 6 of the accompanying drawings.

14. A ceiling panel substantially as herein described with reference Figures 4, 5 and 6 of the accompanying drawings.

15. A suspended ceiling system substantially as herein described with reference to Figure 6 of the accompanying drawings.

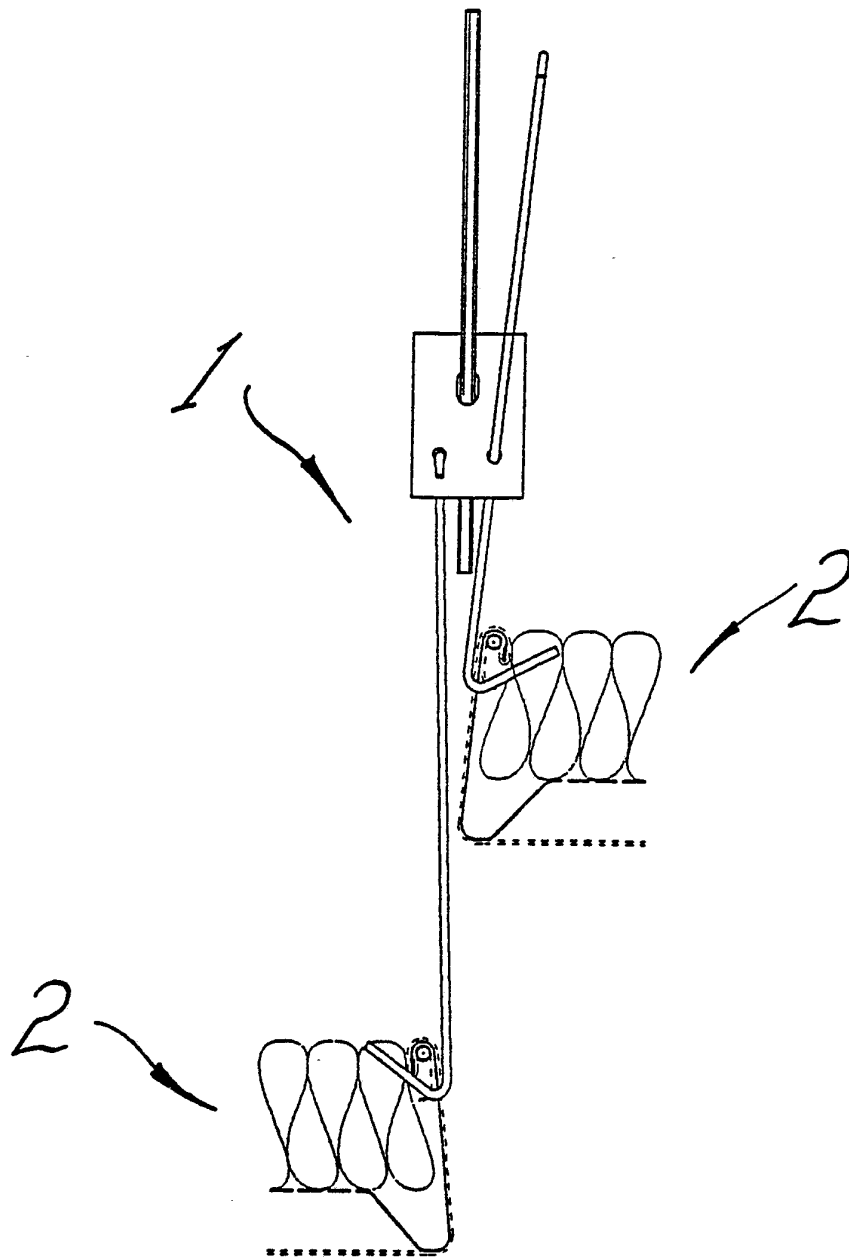


FIG. 1

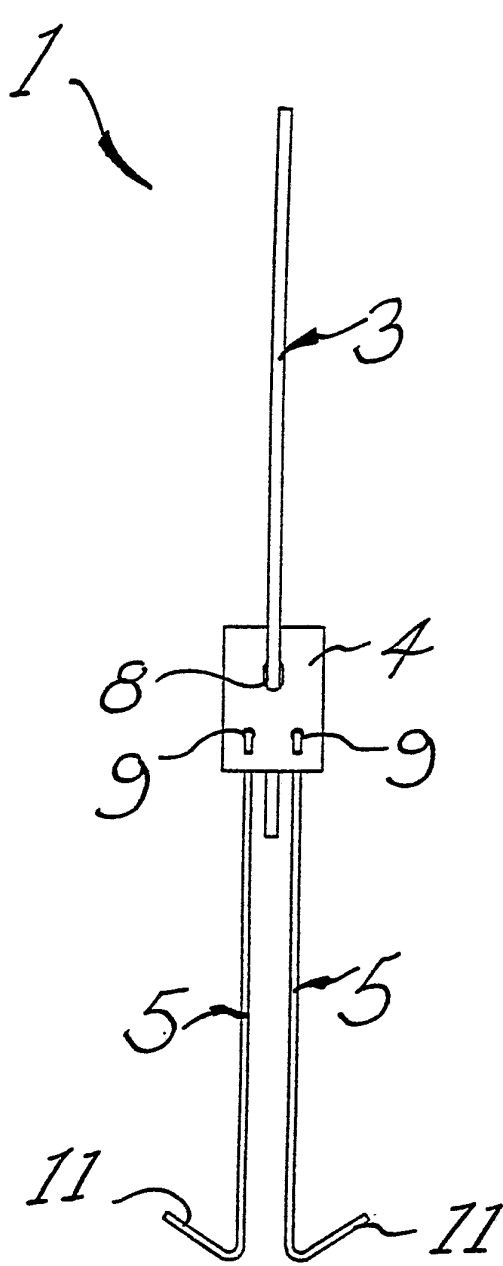


FIG. 2

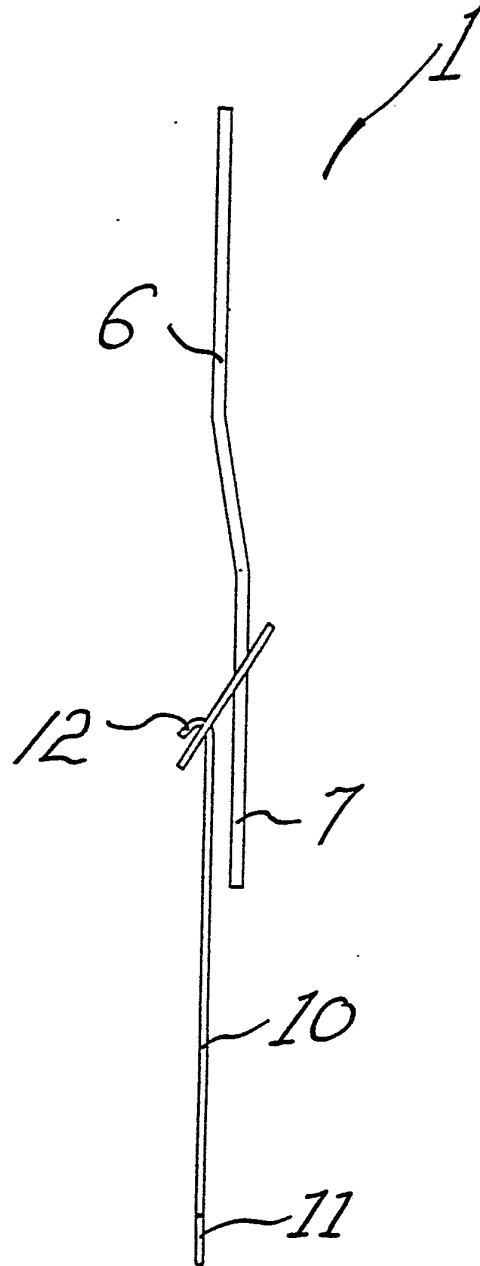
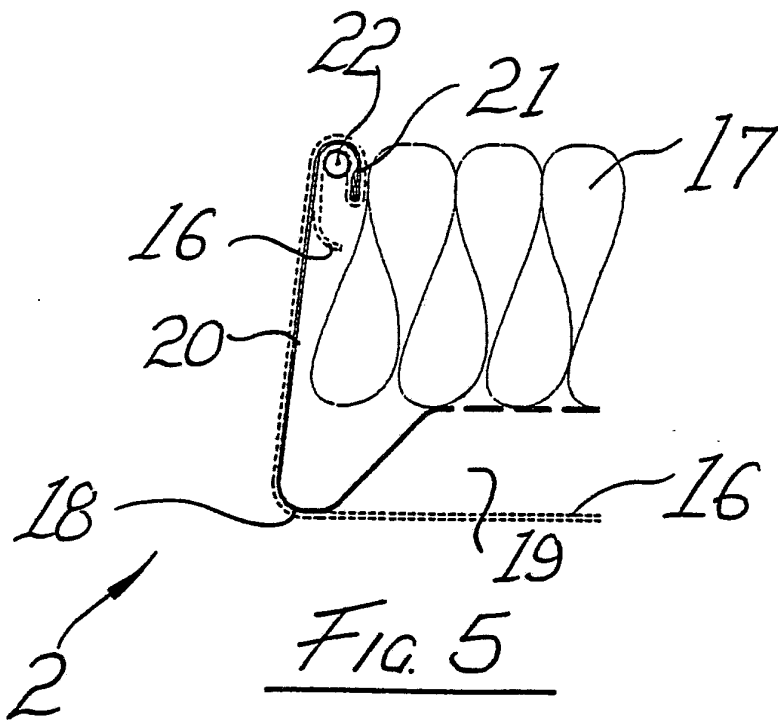
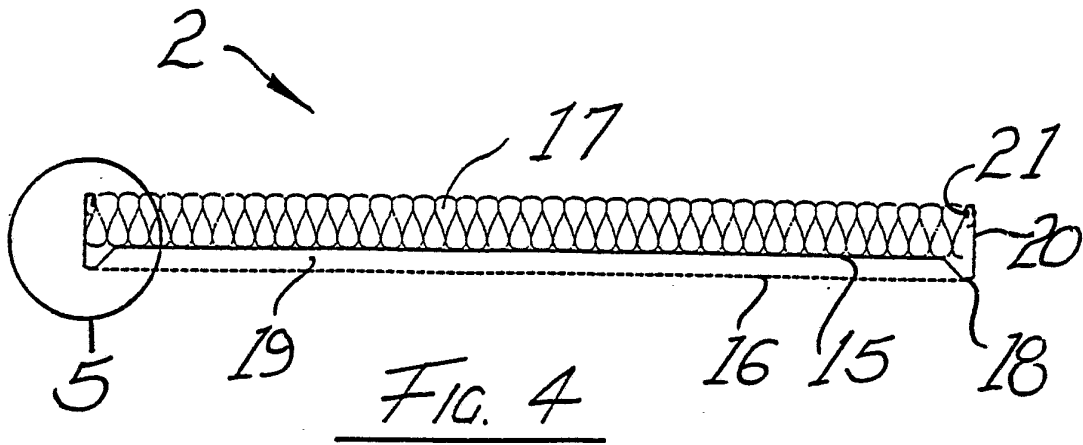


FIG. 3



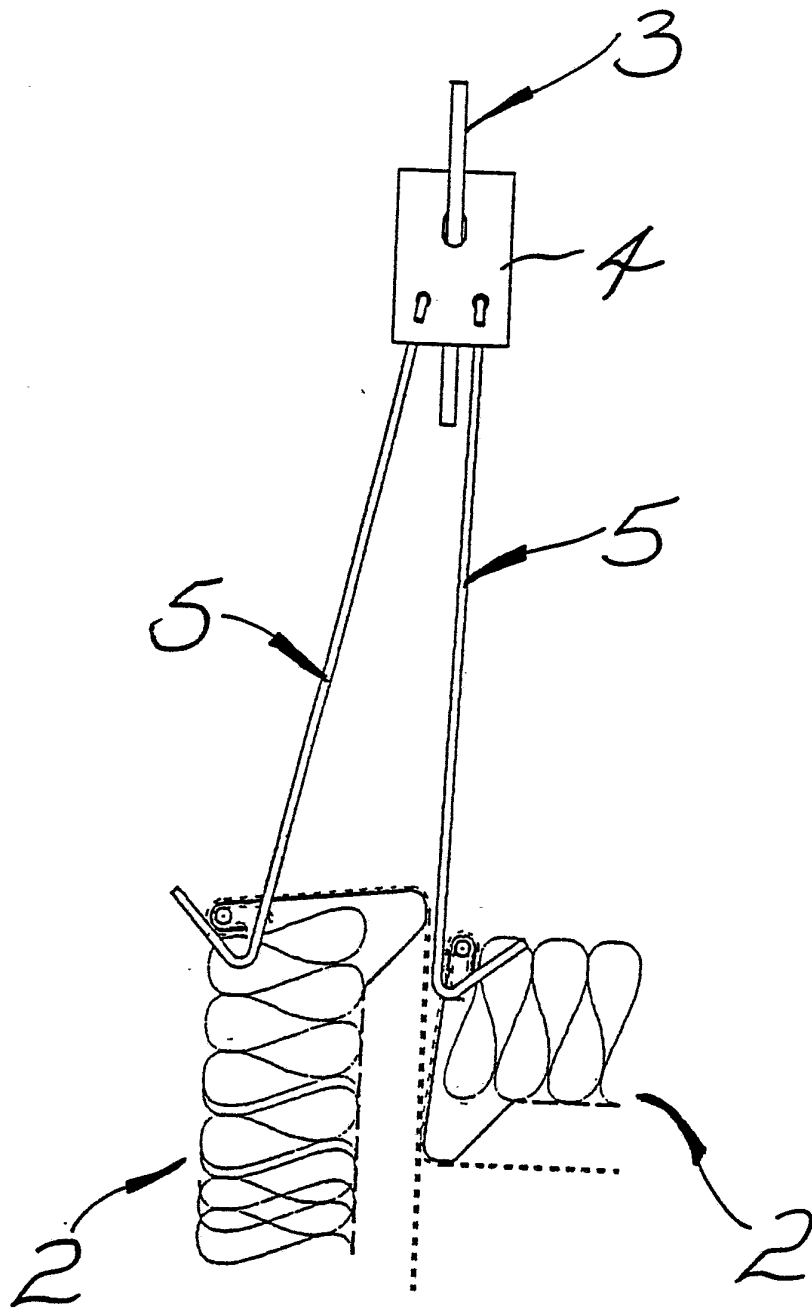
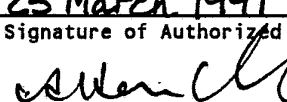


FIG. 6

INTERNATIONAL SEARCH REPORT

International Application No. **PCT/AU 91/00007**

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 E04B 9/20 // E04B 9/04, E04C 2/34		
II. FIELDS SEARCHED		
Minimum Documentation Searched 7		
Classification System	Classification Symbols	
IPC ⁵	E04B 9/20, E04C 2/34	
IPC ⁴	E04B 5/58	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 8		
AU : IPC ⁴ and IPC ⁵ as above		
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
X	DE,A, 2246064 (PROFIL-VERTRIEB GmbH) 28 March 1974 (28.03.74) See figure 3	(1,2)
X	DE,A, 2728912 (KONIG) 18 January 1979 (18.01.79) See figures 1-4	(1,2)
A	DE,A, 1945569 (BEFESTIGUNGS-TECHNIK BEDO-DORTMUND JOACHIM SEIFFERT) 8 April 1971 (08.04.71) See whole document	(1,2)
A	GB,A, 1452827 (PHILIPS ELECTRONIC & ASSOC. INDUST. LTD) 20 October 1976 (20.10.76) See whole document	(1,2)
A	EP,A, 37061 (RICHTER-SYSTEM GmbH & CO. KG) 7 October 1981 (07.10.81) See whole document	(1,2)
(continued)		
* Special categories of cited documents: 10		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier document but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
13 March 1991 (13.03.91)	25 March 1991	
International Searching Authority	Signature of Authorized Officer	
Australian Patent Office	 M.G. KRAEFFT	

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

X,Y	GB,A, 1496663 (CHAMPION INTERNATL CORP) 30 December 1977 (30.12.77) See page 2 lines 5 to 40 and figures 1 and 3	(3,5-7)
Y	GB,A, 1132774 (DEUTSCHE BAUAKADEMIE) 6 November 1968 (06.11.68) See page 2 lines 15-21 and figure 3 especially	(3,5,6)
A	FR,A, 1396174 (BERGERIOUX) 26 July 1965 (26.07.65) See whole document	(3)
A	US,A, 4045931 (BECKER) 6 September 1977 (06.09.77) See whole document	(3)
A,P	AU,A, 43641/89 (HEAD) 26 April 1990 (26.04.90) See whole document	(3)

V. OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE 1

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claim numbers ..., because they relate to subject matter not required to be searched by this Authority, namely:

2. Claim numbers , because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claim numbers ..., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4 (a):

VI. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING 2

This International Searching Authority found multiple inventions in this international application as follows:

The invention common to claims 1, 2 and 13 is characterised by the construction details of a hanger for a suspended ceiling system. The invention of claims 3-11 and 14 is directed to a ceiling panel. These groups of inventions are not linked so as to relate a single general inventive concept.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

The additional search fees were accompanied by applicant's protest.

No protest accompanied the payment of additional search fees.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 91/00007

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document
Cited in Search
Report

Patent Family Members

DE 2246064

DE 2728912

DE 1945569

BE 755179
NL 7013270

CH 525405

FR 2060681

GB 1452827

DE 2353948

FR 2206425

NL 7215431

EP 37061

DE 3012261

GB 1496663

US 4045931

AT 2345/71
DE 2013115
US 3811239

CA 981171
FR 2084876

CH 526387
GB 1352753

AU 43641/89

END OF ANNEX