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A mine roof support mesh with intergral hooks

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ABSTRACT

A mine support mesh for a roof of a mine is disclosed. The mesh (3) is characterised by a plurality of hook members (7) that can be bent from a transport/storage position in which the hook members are in a plane of a mesh section of the mesh to an operative position (with the mesh bolted to a mine roof) in which the hook members can support a side wall mesh to facilitate bolting the mesh to a side wall. A particular form of the hook member is also disclosed.

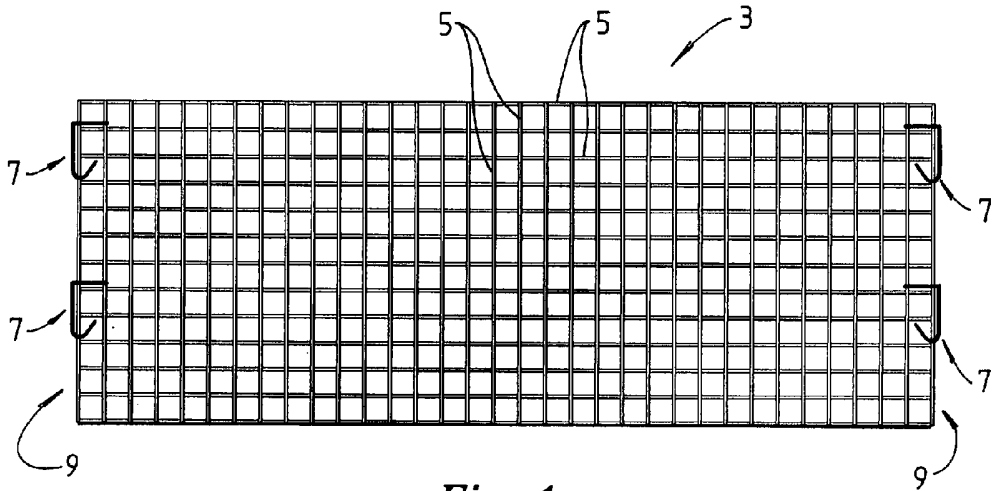

Fig. 1

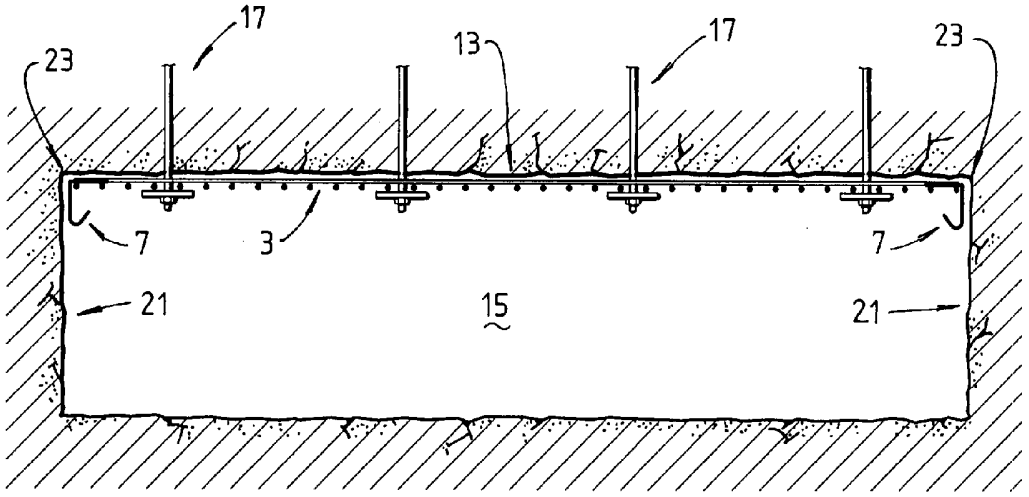

Fig. 2

AUSTRALIA

Patents Act 1990

COMPLETE SPECIFICATION

STANDARD PATENT

Applicant(s):

ONESTEEL REINFORCING PTY LTD

Invention Title:

A MINE ROOF SUPPORT MESH WITH INTERGRAL HOOKS

The following statement is a full description of this invention, including the best method of performing it known to me/us:

A MINE ROOF SUPPORT MESH

The present invention relates to a mine support mesh for stabilising roof and side wall strata of underground mines.

The present invention also relates to a support hook member that can be used as part of such a mine roof support mesh.

It is known to stabilise roof and side wall strata of underground mines, such as roof and side wall strata that define a drive in an underground mine, by using support mesh that is retained in place by rock bolt assemblies.

The support mesh is formed from a network of interconnected elongate members that include a first layer of parallel elongate members that are welded to a second layer of parallel elongate members that are transverse to the elongate members of the first layer at intersections of elongate members.

Each elongate member may be a single wire or multiple wires, such as double wires, that are positioned side by side in contact with each other.

Usually, although not always, rigid mesh is used to support roof strata and flexible mesh is used to support side wall strata.

In use, sheets of support mesh are positioned against roof and side wall strata and rock bolts of rock bolt assemblies are positioned to extend through openings in "bolting" sections of the mesh and into holes that are drilled in the roof and side wall strata. Thereafter, tensioning nuts and bearing plates of rock bolt assemblies

are positioned on the rock bolts and clamp the mesh sheets to roof and side wall strata.

In practice, the process of rock bolting side wall support mesh requires that the mesh be held against a side wall by a person at least during an initial stage of the rock bolting operation. This is not a straightforward exercise, particularly in situations in which space is limited and there is a need to work quickly, which is invariably the case in underground mining situations.

In particular, in some situations, the space constraints make it necessary for one of the operators of a mesh bolting machine to stand off the machine and reach under a bolter assembly of the machine and hold a mesh sheet against the side wall while the first couple of rock bolt assemblies are installed. This is an undesirable practice because an accidental downward movement of the bolter assembly would result in serious injury to the operator.

In addition, in practice, it is difficult to position rock bolt assemblies in roof and side wall strata closer than 300mm from the corners of roofs and side walls. As a consequence, there is a risk of rock breakthrough from such corners.

The present invention is concerned with coupling together mine support mesh at the corners of roofs and side walls of underground mines to facilitate rock bolting side wall support mesh and to improve resistance of the mine support mesh to rock breakthrough at the corners.

The present invention provides a mine support mesh that is characterised by a plurality of hook members that can be bent from a transport/storage position in which the hook members are in the plane of a mesh section

of the mesh to an operative position (with the mesh bolted to a mine roof) in which the hook members can support a side wall mesh to facilitate bolting the mesh to a side wall.

The present invention also provides a particular form of the hook member.

According to the present invention there is provided a mine support mesh for bolting or otherwise securing to a roof of an underground mine, the mine having a roof and side walls, which mesh includes:

(a) a mesh section that includes a network of interconnected elongate members that includes at least a first layer of parallel elongate members that extend between opposite ends of the mesh section and are welded to a second layer of parallel elongate members that extend transverse to the elongate members of the first layer at intersections of the elongate members; and

(b) a plurality of hook members connected to the mesh section at least at one end of the mesh section, with the hook members being adapted to be bent, either prior to or after the mesh has been rock bolted or otherwise secured to the mine roof, from a transport/storage position in which the hook members are at least substantially in a plane of the mesh section to an operative position to define hooks for supporting a side wall mine support mesh that is to be rock bolted or otherwise secured to one of the side walls.

The term "plane of the mesh section" is understood herein to mean an imaginary plane, typically is a flat plane, that passes through the mesh section.

Preferably each hook member includes a first arm that is connected to the mesh section, a second arm that extends from the first arm, and a hooked end section that extends from the second arm, with the first arm and the second arm and the hooked end section being substantially in the plane of the mesh section when the hook member is in the transport/storage position, and with the second arm being formed so that it can be bent out of the plane of the mesh section to move the hooked end from the transport/storage position to the operative position.

Preferably the first arm extends parallel to the elongate members of the first layer.

Preferably the second arm extends parallel to one of the elongate members of the second layer.

In one embodiment, the first arm is connected to the mesh section by being welded to the mesh section.

In another, although not the only other, embodiment the first arm is connected to the mesh section by mechanically gripping the mesh section.

Preferably the first arm includes a kinked section that extends transversely to the axis of the first arm and can be fitted over and mechanically engage one of the elongate members of the mesh section.

According to the present invention there is also provided hook member adapted to be mechanically connected to a mesh section to form a mine roof support mesh for an underground mine, which mesh section includes a network of

interconnected elongate members that includes at least a first layer of parallel elongate members welded to a second layer of transverse parallel elongate members at intersections of the elongate members, and which hook member includes a first arm that is adapted to be mechanically connected to the mesh section, a second arm that extends from the first arm, and a hooked end section that extends from the second arm.

The present invention is described further with reference to the accompanying drawings, of which

Figure 1 is a plan view of one embodiment of a mine support mesh in accordance with the present invention in an as-manufactured form;

Figure 2 is a vertical section through a drive of an underground mine that illustrates the mine support mesh shown in Figure 1 positioned against a roof of the drive with the hook members bend downwardly to be coupled to mine support mesh when located against the side walls of the drive;

Figure 3 is a sketch that illustrates in detail one of the hook members in the as-manufactured form of the mesh shown in Figure 1;

Figure 4 is a sketch that illustrates a hook member of another embodiment of a mine support mesh in accordance with the present invention in an in use position;

Figure 5 is a sketch that illustrates a hook member of another embodiment of a mine roof support mesh in accordance with the present invention in an IN use position; and

Figure 6 is a perspective view of the hook member shown in Figure 5.

The mine roof support mesh, generally identified by the numeral 3, shown in the figures includes a mesh section that is constructed from steel wires 5 of the same diameter that are positioned and welded together as shown to form a network of two layers of mutually perpendicular intersecting wires.

When viewed in top plan, the mesh section defines a generally rectangular, flat, sheet.

The mesh 3 further includes two hook members 7 located at each opposite end 9 of the mesh section.

In the as-manufactured form, the hook members 7 are in the same plane as the mesh section. In this transport and storage position, the mesh 3 can be stacked and transported from a manufacturing site to a mine site and handled at the mine side as per conventional mesh that does not include the hook members 7. Specifically, in this transport/storage position the hook members 7 do not interfere with handling of the mesh 3.

With reference to Figure 2, the mesh 3 shown in Figure 1 is held against a roof 13 of an underground drive 15 shown in the figure by rock bolt assemblies that are generally identified by the numeral 17. The length of the mesh 3 is substantially the same as the width of the drive 15. It is noted that the present invention is not limited to such an arragement.

With further reference to Figure 2 the hook members 7 are bent downwardly from the plane of the mesh section and form downwardly extending hooks - this is an operative position of the hook member 7.

Whilst not shown in Figure 2, it can be appreciated from the figure that the hooks are a conveniently located means for suspending side wall support mesh against side walls 21 of the drive 15 so that the support mesh can then be bolted conveniently and quickly to the side walls 21.

Specifically, a side wall support mesh can be readily suspended from the hook members 7 at one end 9 of the mesh 3 by positioning a wire 5 at an upper end of the side wall support mesh to be cradled by the hook sections of the hooks.

The use of the hook members 7 make it unnecessary for operators to support side wall support mesh while the mesh is being secured to the side walls with rock bolt assemblies.

It can also readily be appreciated from Figure 2 that the coupling together of the roof support mesh 3 and the side wall support mesh (not shown) via the hook members 7 improves the resistance to breakthrough of rock in the corners 23 of the drive 15. This is a particular advantage of the mesh.

Figure 3 illustrates one of the hook members 7 of the mesh shown in Figures 1 and 2 in the as-manufactured transport/storage position and in the in-use operative position (shown by dotted outline).

With reference to Figure 3, the hook member 7 is formed from steel wire and includes a first straight arm 27 that is welded to one of the lengthwise extending wires 5 of the mesh section, a second straight arm 29 that extends at right angles to the first arm 27, and a hooked end section 31 on the end of the second arm 29.

The steel and the gauge of the wire are selected so that the hooked end section 31 and the second arm 29 can be bent out of the plane of the mesh section to the operative position indicated in outline on the figure.

The embodiment of the hook member 7 shown in Figure 4 is similar to the hook member 7 shown in Figures 1 to 3 and the main difference is that the Figure 4 hook member 7 is secured to the mesh section by mechanically connecting the hook member 7 to the mesh section by folding the wire partially around the transverse wires 5 rather than by welding the hook member 7 to the wires 5.

The embodiment of the hook member shown in Figures 5 and 6 is similar to the embodiment shown in Figure 4 and the main difference is the type of mechanical connection between the hook member 7 and the mesh section. Specifically, the Figure 4 hook member 7 is formed with kinked sections 35 near opposite ends of the first arm 27 that facilitate clipping the hook member 7 onto one of the wires 5 and thereby mechanically connecting the hook member 7 to the wire 5.

Many modifications may be made to the preferred embodiment of the present invention described above without departing from the spirit and scope of the present invention.

By way of example, whilst the preferred embodiment of the mesh includes 2 hooked members 7 at each end of the mesh, the present invention is not so limited and extends to any suitable number of hooked members at one or both ends.

By way of further example, whilst part of the preferred embodiment, the present invention is not limited

to wires 5 of the same diameter.

In addition, whilst part of the preferred embodiment, the present invention is not limited to networks of intersecting wires 5 that form flat and rigid sheets.

In addition, the present invention is not limited to networks of intersecting wires 5 that form two layers of wires.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A mine support mesh for bolting or otherwise securing to a roof of an underground mine, the mine having a roof and side walls, which mesh includes:

(a) a mesh section that includes a network of interconnected elongate members that includes at least a first layer of parallel elongate members that extend between opposite ends of the mesh section and are welded to a second layer of parallel elongate members that extend transverse to the elongate members of the first layer at intersections of the elongate members; and

(b) a plurality of hook members connected to the mesh section at least at one end of the mesh section, with the hook members being adapted to be bent, either prior to or after the mesh has been rock bolted or otherwise secured to the mine roof, from a transport/storage position in which the hook members are at least substantially in a plane of the mesh section to an operative position to define hooks for supporting a side wall mine support mesh that is to be rock bolted or otherwise secured to one of the side walls.

2. The mesh defined in claim 1 wherein each hook member includes a first arm that is connected to the mesh section, a second arm that extends from the first arm, and a hooked end section that extends from the second arm, with the first arm and the second arm and the hooked end section being substantially in the plane of the mesh section when the hook member is in the transport/storage

position, and with the second arm being formed so that it can be bent out of the plane of the mesh section to move the hooked end from the transport/storage position to the operative position.

3. The mesh defined in claim 2 wherein the first arm extends parallel to the elongate members of the first layer.

4. The mesh defined in claim 2 or claim 3 wherein the second arm extends parallel to one of the elongate members of the second layer.

5. The mesh defined in any one of claims 2 to 4 wherein the first arm is connected to the mesh section by being welded to the mesh section.

6. The mesh defined in any one of claims 2 to 4 wherein the first arm is connected to the mesh section by mechanically gripping the mesh section.

7. The mesh defined in claim 6 wherein the first arm includes a kinked section that extends transversely to the axis of the first arm and can be fitted over and mechanically engage one of the elongate members of the mesh section.

8. A hook member adapted to be mechanically connected to a mesh section to form a mine roof support mesh for an underground mine, which mesh section includes a network of interconnected elongate members that includes at least a first layer of parallel elongate members welded to a second layer of transverse parallel elongate members at intersections of the elongate members, and which hook member includes a first arm that is adapted to be mechanically connected to the mesh section, a second arm that extends from the first arm, and a hooked end section

that extends from the second arm.

9. A mine support mesh for an underground mine substantially as hereinbefore described with reference to the accompanying drawings.

10. A hook member substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 2nd day of May 2003
ONESTEEL REINFORCING PTY LTD
By their Patent Attorneys
GRIFFITH HACK
Fellows Institute of Patent and
Trade Mark Attorneys of Australia

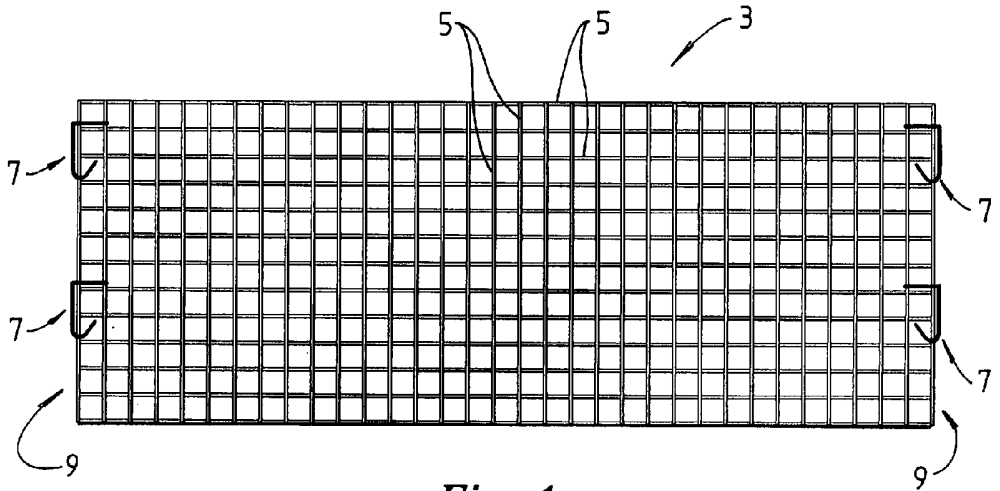

Fig. 1

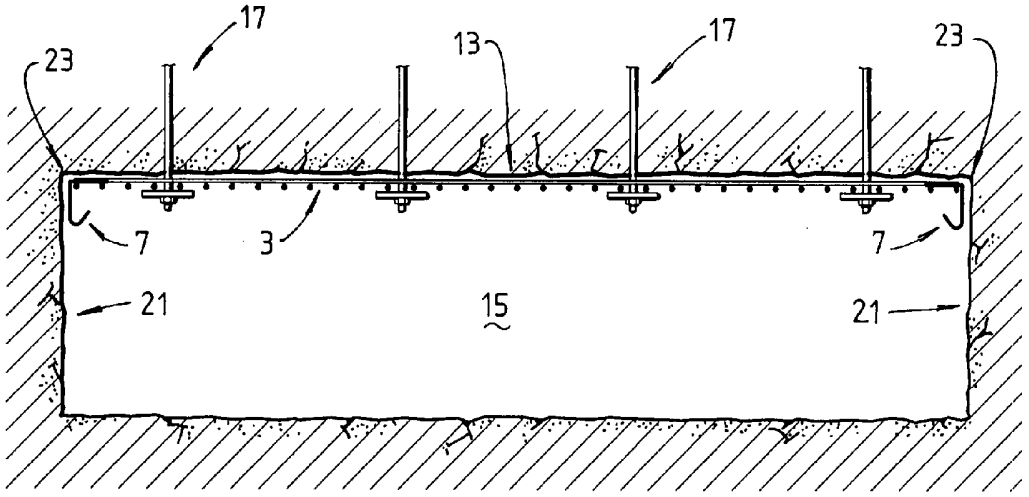

Fig. 2

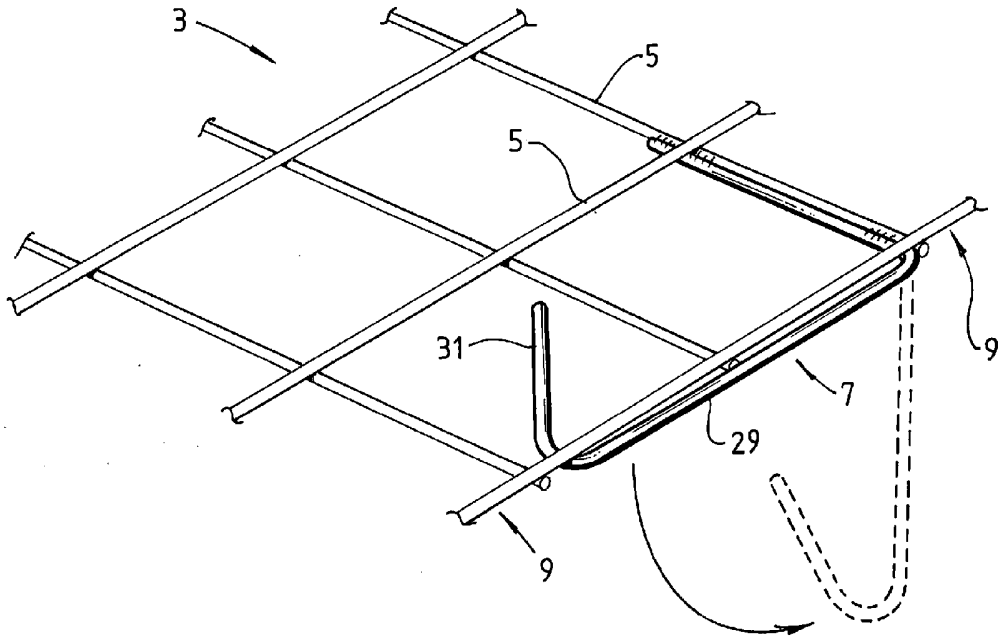

Fig. 3

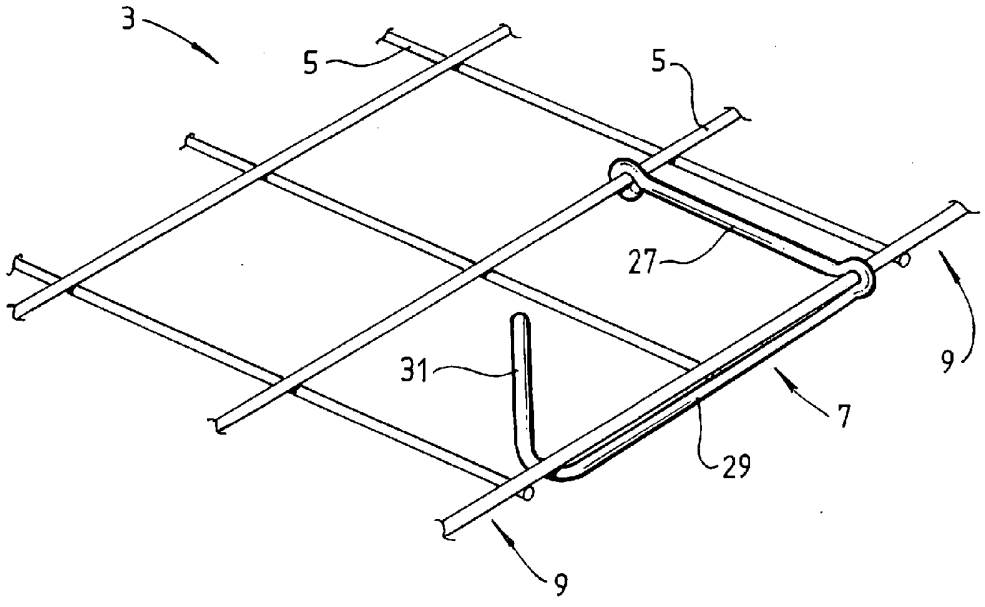

Fig. 4

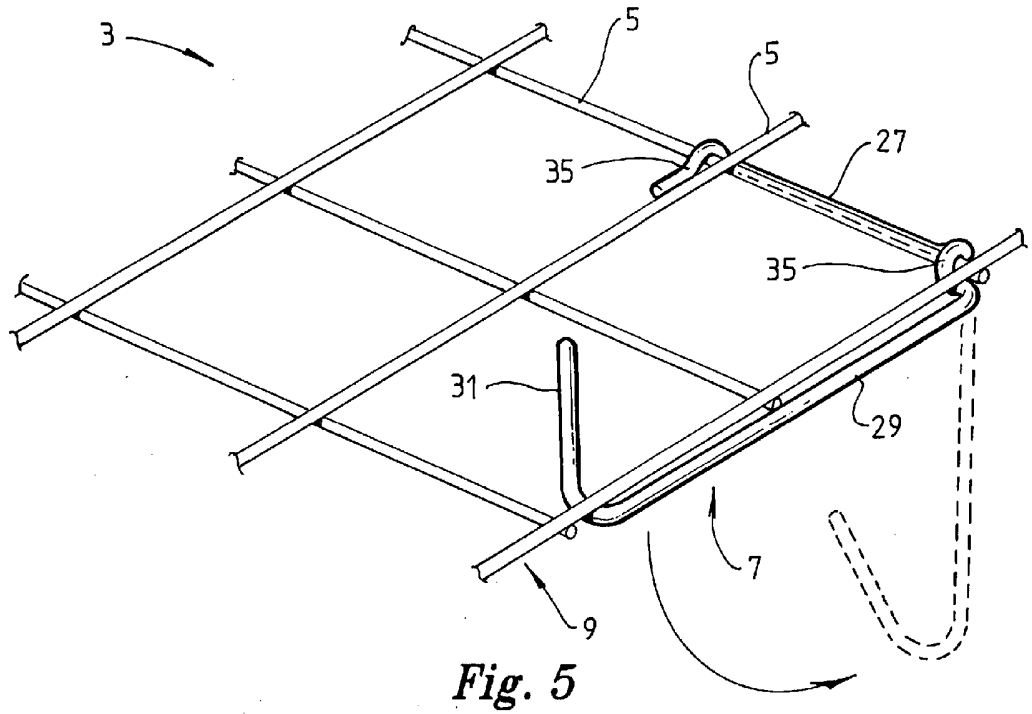

Fig. 5

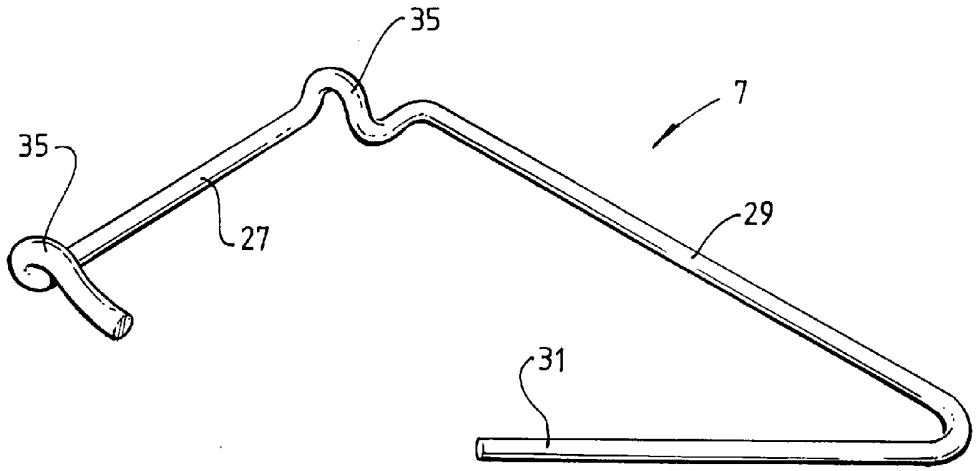

Fig. 6