

5 This invention relates to a blast curtain. The invention also relates to a rock support system and a method of installing a rock support system.

The invention is expected to be particularly advantageously applicable to rock blasting during tunnel excavation in mines. Accordingly, such applications should particularly, but not exclusively, be borne in mind when considering this specification.

Background of the invention:

Generally, blasting works by drilling a number of holes into rock, filling the holes with explosives, and detonating the explosives causing the rock to collapse. Thereafter, rubble is removed, and the new tunnel reinforced. The steps are repeated until the desired excavation is complete.

The inventor is aware of blast curtains that are used to contain a blast and prevent fly rock. However, known blast curtains do not provide sufficient yield to contain fly rock from high force blasts.

The present invention aims to provide an improved blast curtain and rock support system capable of containing a high blast force.

Summary of the invention:

In accordance with the invention, broadly, there is provided a blast curtain which includes:

a wire mesh made of low carbon steel wire of which the loose wire ends running along a fringe of the wire mesh are tied-up.

More particularly, according to a first aspect of the invention, there is provided a blast curtain which includes:

a wire mesh made of low carbon steel wire having a plurality of wire ends along a fringe of the wire mesh and wherein adjacent wire ends are tied up in order to strengthen and reinforce the fringe and consequently, the blast curtain.

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The blast curtain may include at least one looped wire end that is interlocked with an adjacent looped wire end.

10 The at least one looped wire end may be interlocked with the adjacent looped wire end by twisting the wire ends together.

The at least one looped wire end may be tied to itself with a fastener, and likewise, the adjacent looped wire end may be tied to itself with a fastener.

15 The fastener may include a clamp, for example a clip.

20 The blast curtain may include a cable for operative installation of the blast curtain at a rock face or roof of a mining tunnel. To this end, the cable may be threaded through the wire mesh and clamped at either ends by at least one cable clamp to secure the cable to the wire mesh.

The cable may be looped at at least one end for operative installation of the blast curtain to a mounting point (such as a rock bolt) on the rock face or tunnel roof.

25 The wire mesh may be galvanised.

Advantageously, the blast curtain may be folded for easy of transport and installation.

30 According to another aspect of the invention there is provided a rock support system which includes:

the blast curtain as hereinbefore described, the blast curtain being hung from a roof of a tunnel by attaching the cable of the blast curtain to any one or more of: the roof and walls of the tunnel.

The rock support system may include one or more mounting points to which the ends of the cable are attached. The one or more mounting points may include one or more bolts installed in the rock face.

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According to yet another aspect of the invention there is provided a method of installing a rock support system which includes the steps of:

attaching a blast curtain as hereinbefore described substantially vertically by hanging an upper end of the blast curtain from a roof of a tunnel short of the rock face; and

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subsequent to blasting the rock at the rock face and with the upper end of the curtain attached, lifting an operative lower end of the blast curtain and attaching the lower end to the roof of the tunnel to create a substantially horizontal roof support.

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Advantageously, blast curtains of the like may be consecutively installed as the rock face advances through consecutive blasting.

The invention is now described, by way of non-limiting example, with reference to the accompanying diagrammatic drawings.

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Drawings:

In the drawings,

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Figure 1 illustrates, schematically, a blast curtain in accordance with one aspect of the invention.

Figure 2 shows an enlarged view of the blast curtain of figure 1 in accordance with this aspect of the invention.

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Figures 3 and 4 show, schematically, enlarged views of the interlocked looped wire ends and fasteners of the blast curtain in accordance with this aspect of the invention.

Figure 5 illustrates, schematically, a rock support system according to another aspect of the invention.

Figure 6 illustrates, schematically, a blast curtain in accordance with another aspect of the invention.

Figure 7 shows an enlarged view of the blast curtain of figure 6 in accordance with this aspect of the invention.

Figure 8 shows, schematically, an enlarged view of the interlocking looped and twisted wire ends of the blast curtain in accordance with this aspect of the invention.

Figures 9, 10 and 11 illustrate a method of installing a rock support system according to yet another aspect of the invention.

In the drawings, like reference numerals denote like parts unless otherwise indicated.

Detailed description of the invention:

In figure 1 of the drawings, reference numeral (10) denotes, generally, a blast curtain in accordance with one embodiment of the invention. Referring to the enlarged view of the blast curtain (10) in figure 2, the blast curtain (10) comprises a wire mesh (14) made of low carbon galvanised steel wire having a plurality of wire ends along a fringe (15) of the wire mesh and wherein adjacent wire ends of which two are denoted by numerals (18) and (20) are tied up in order to strengthen and reinforce the fringe (15) and consequently, the blast curtain (10).

The plurality of wire ends are looped, and adjacent wire ends of which two are denoted as (18) and (20) are interlocked. Each wire end is tied to itself with a fastener in the form of a clamp, of which one is shown by numeral (22).

The blast curtain (10) includes a cable (16) for operative installation of the blast curtain at a rock face or roof of a mining tunnel as will become more apparent in figure 5. To this end, the cable (16) is threaded through the wire mesh (14) and clamped at either ends with cable clamps (of which one is shown as (24)) to secure the cable (16) to the wire mesh (14). The cable (16) is looped at (12) for operative installation of the blast curtain (10) to a mounting point (such as a rock bolt) on the rock face or tunnel roof (not shown here).

In figure 3, the adjacent wire ends (18) and (20) are clearly shown as being interlocked, whereas the fastener (22) can be seen more clearly in figure 4.

Referring to figure 5, numeral (26) denotes, generally, a rock support system according to another embodiment of the invention. The rock support system (26) includes the blast curtain (10) as hereinbefore described, the blast curtain being hung from a roof (28) of a tunnel by attaching the cable (16) of the blast curtain (10) to the roof (28) and wall (30) of the tunnel.

The rock support system (26) has mounting points to which the ends of the cable (16) are attached, the mounting points being rock bolts (32) and (34) that are installed in the rock face.

Turning to figure 6, reference numeral (40) denotes, generally, a blast curtain in accordance with one embodiment of the invention. Referring to the enlarged view of the blast curtain (40) in figure 7, the blast curtain (40) comprises a wire mesh (42) made of low carbon galvanised steel wire having a plurality of wire ends along a fringe (44) of the wire mesh and wherein adjacent wire ends of which two are denoted by numerals (46) and (48) are tied up in order to strengthen and reinforce the fringe (44) and consequently, the blast curtain (40).

The plurality of wire ends are looped, and adjacent wire ends of which two are denoted as (46) and (48) are interlocked. Each wire end is tied to itself by twisting the wire ends together.

The blast curtain (40) includes a cable (50) for operative installation of the blast curtain at a rock face or roof of a mining tunnel in the same fashion as illustrated in figure 5. To this end, the cable (50) is threaded through the wire mesh (42) and clamped at either ends with cable clamps (of which one is shown as (52)) to secure the cable (50) to the wire mesh (42). The cable (50) is looped at (54) for operative installation of the blast curtain (40) to a mounting point (such as a rock bolt) on the rock face or tunnel roof (not shown here).

In figure 8, the adjacent wire ends (46) and (48) are clearly shown as being interlocked by being twisted together.

5 Figures 9, 10 and 11 illustrate a method of installing a rock support system according to another embodiment of the invention. In figure 9, the blast curtain (10) is attached to the roof (28) substantially vertically by hanging an upper end of the blast curtain from the roof of the tunnel short of the rock face (30).

10 In figure 10, and subsequent to blasting the rock at the rock face (30) and with the upper end of the curtain attached, lifting an operative lower end of the blast curtain (10) and attaching the lower end to the roof of the tunnel at (32) to create a substantially horizontal roof support.

15 Figure 11 shows how a blast curtain of the like (34) is installed consecutively as the rock face (30) advances in space by consecutive blasts.

Advantageously, the blast curtain and rock support system as hereinbefore described provides a high-tensile curtain and horizontal support capable of yielding to absorb fly rock.

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Dated this x<sup>th</sup> day of July 2020

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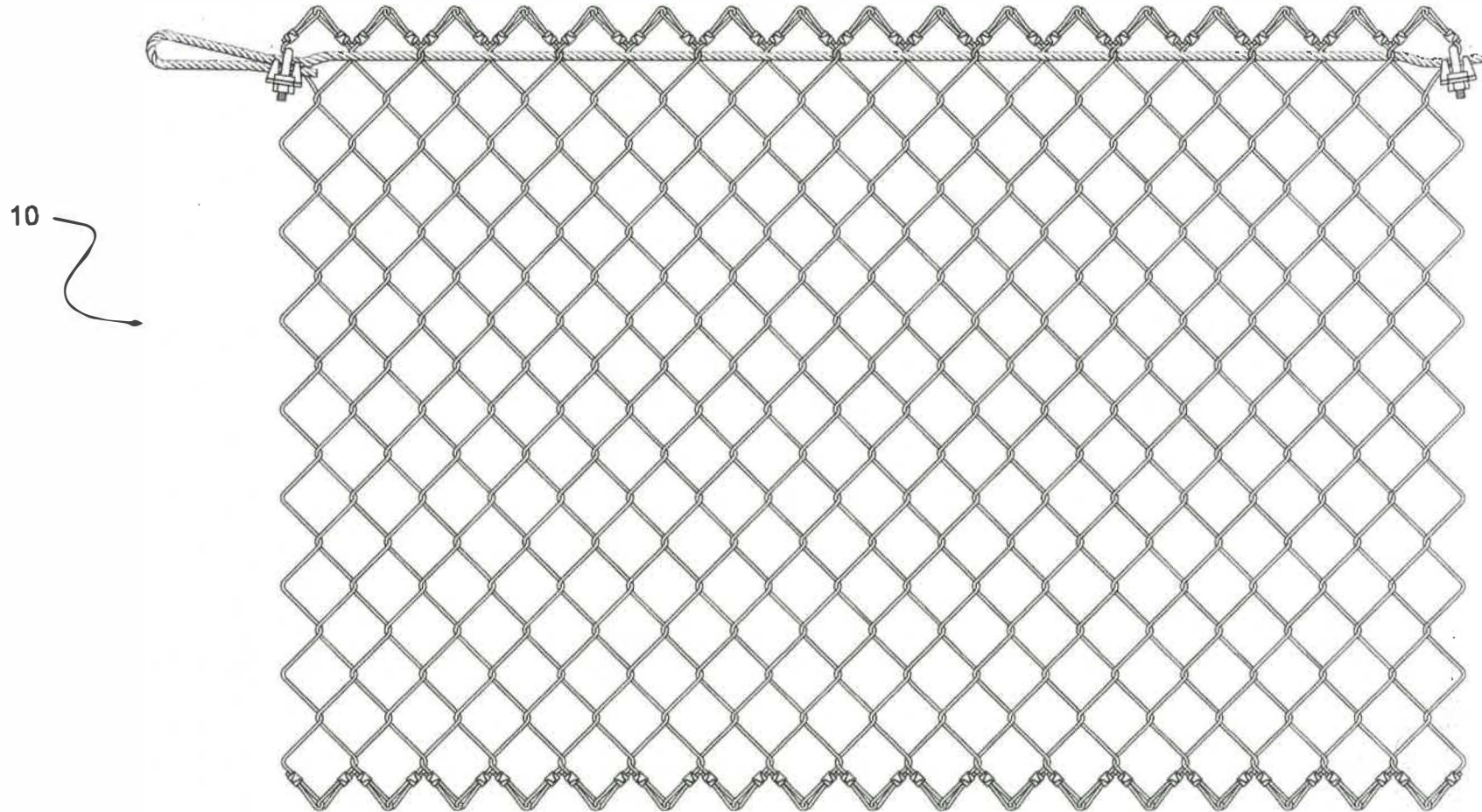


Figure 1

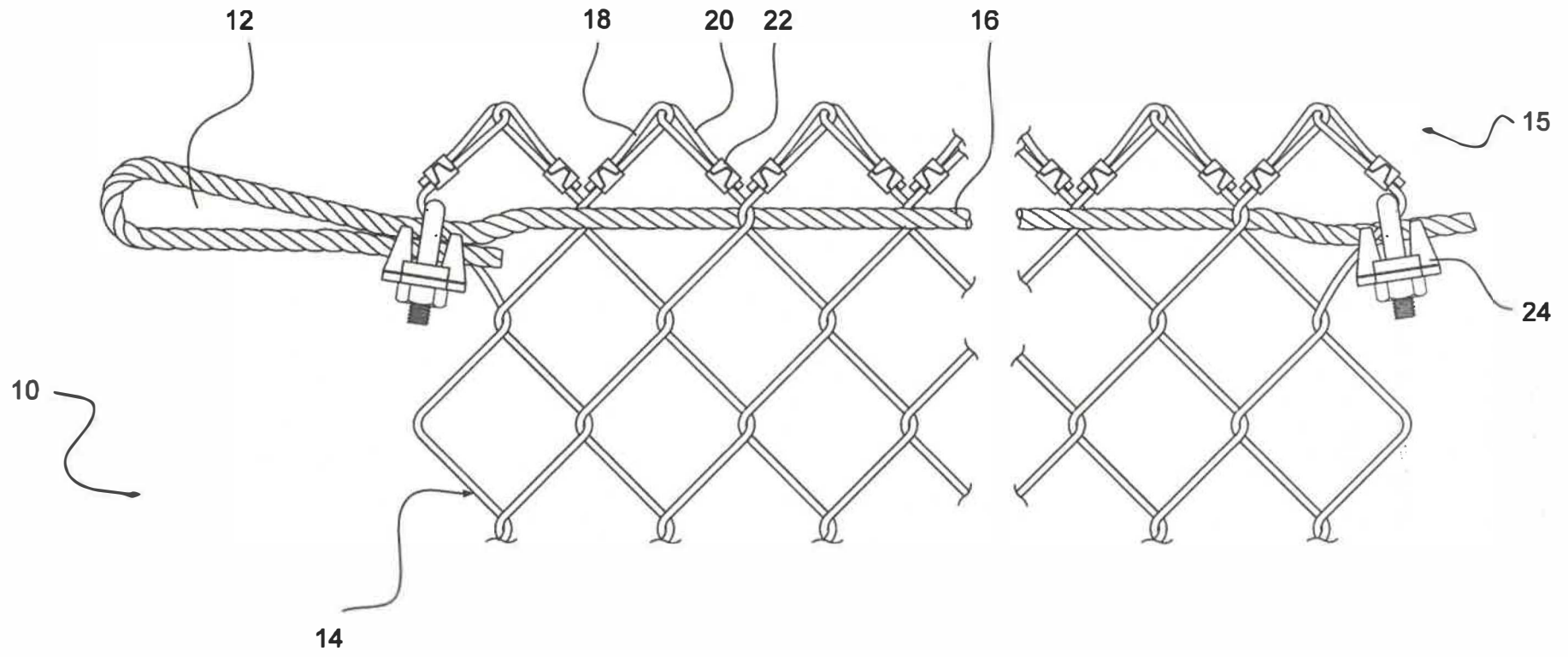


Figure 2



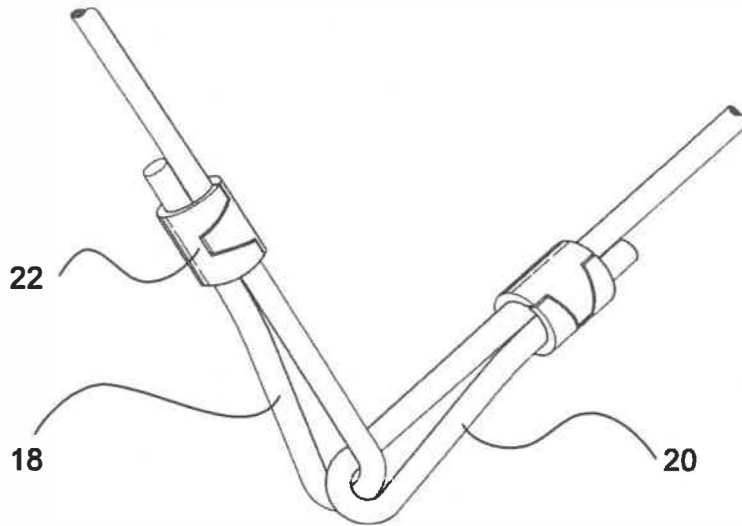


Figure 3

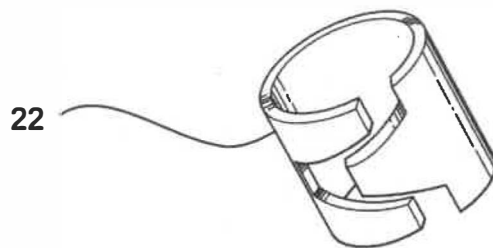


Figure 4

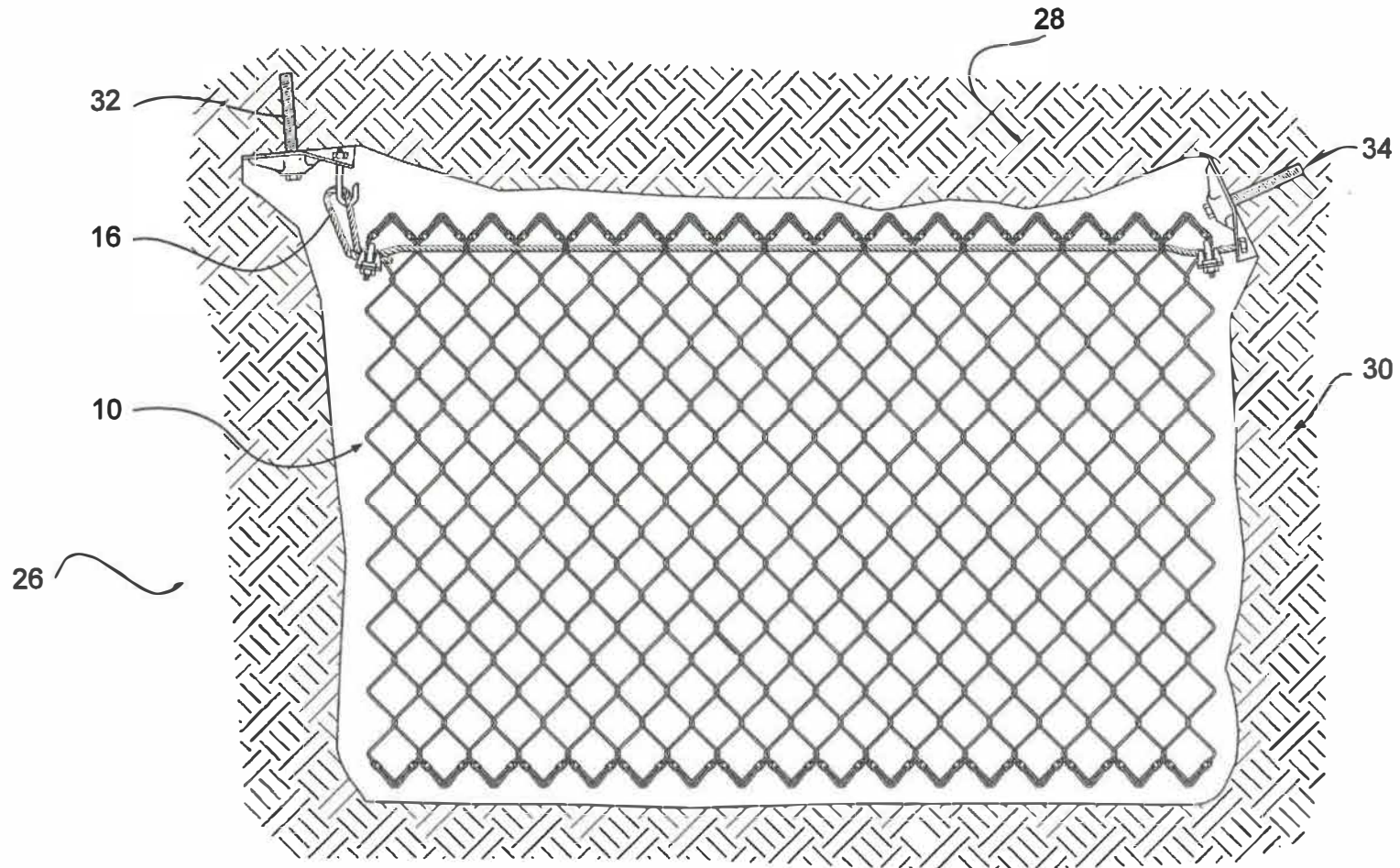


Figure 5

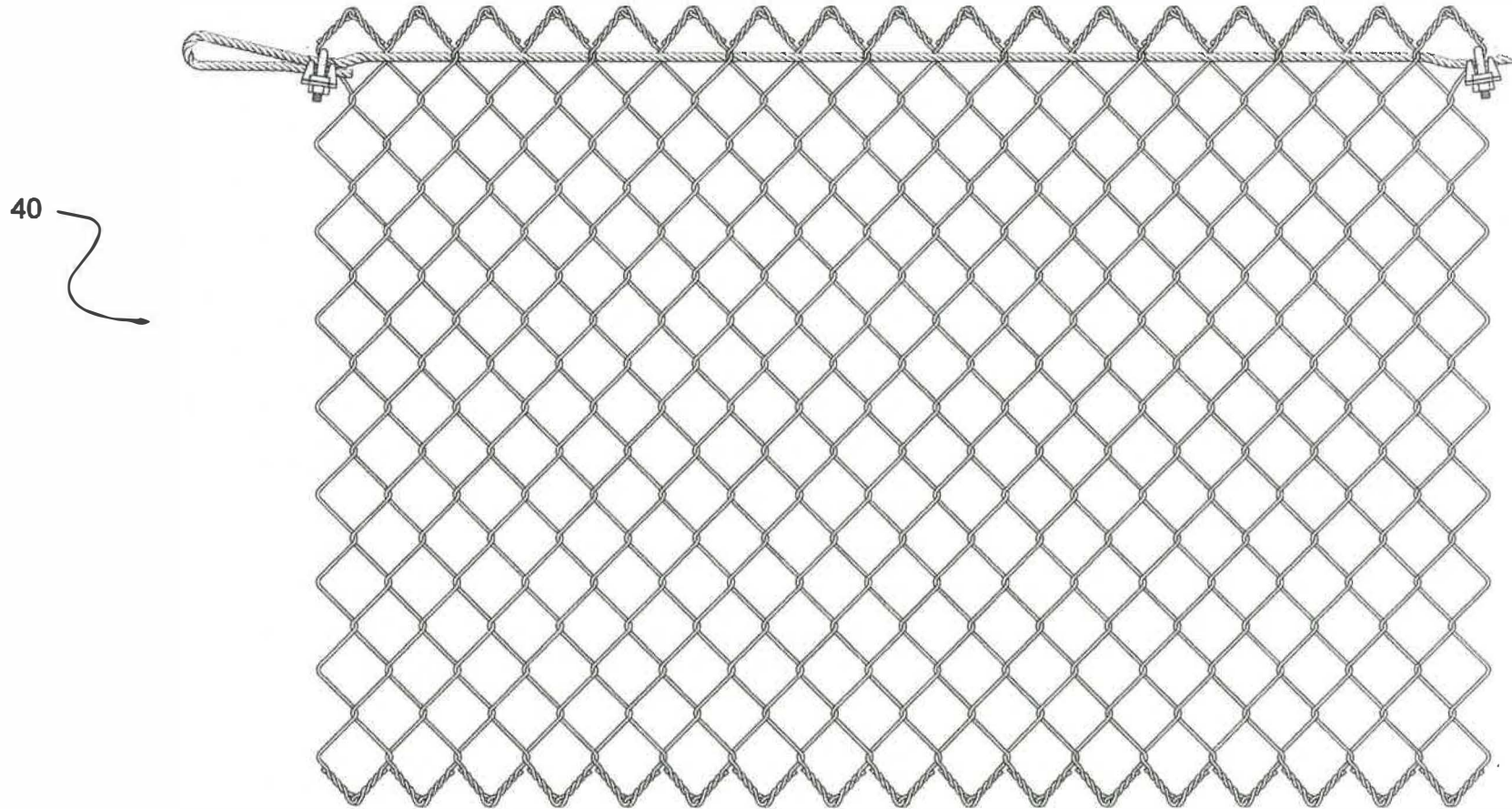


Figure 6

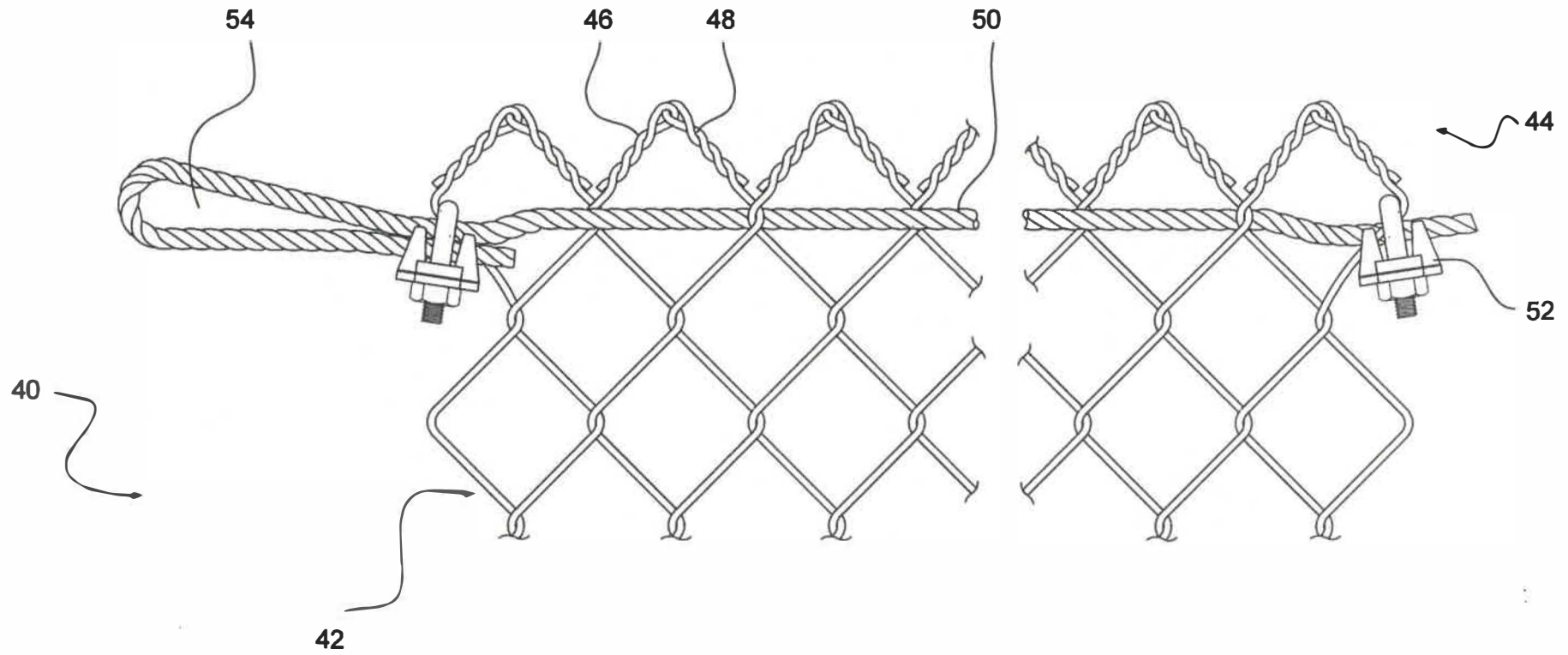


Figure 7

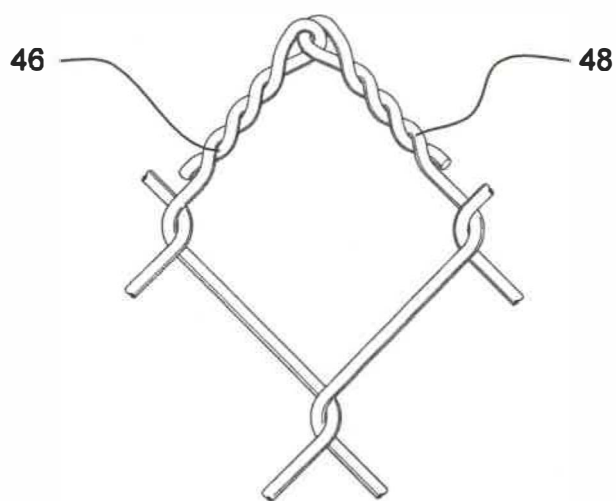


Figure 8

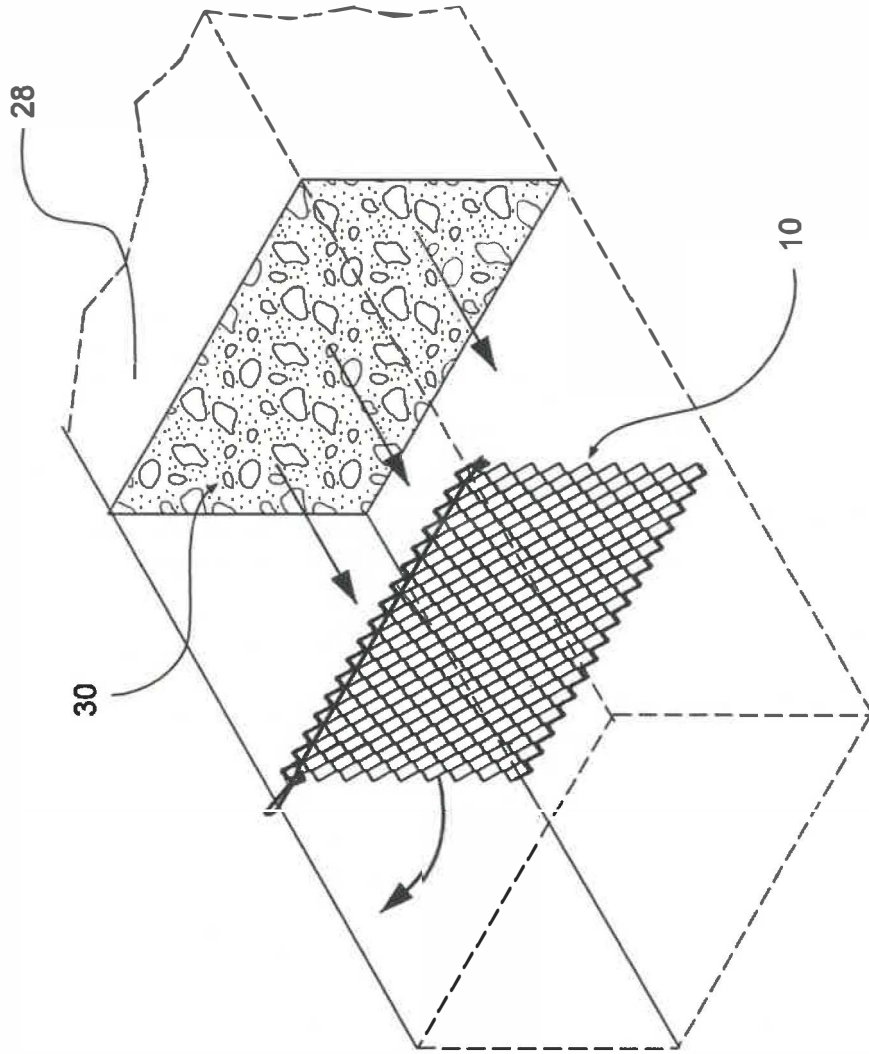


Figure 9

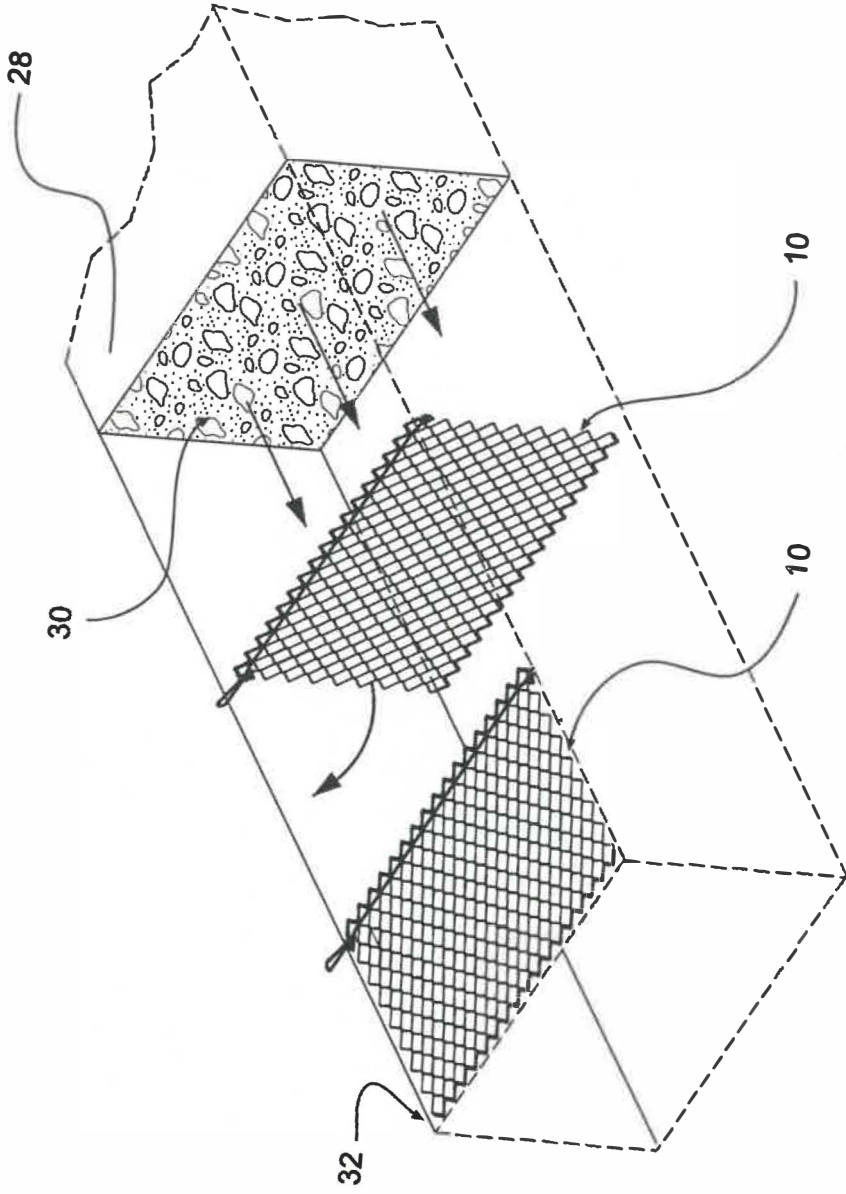


Figure 10

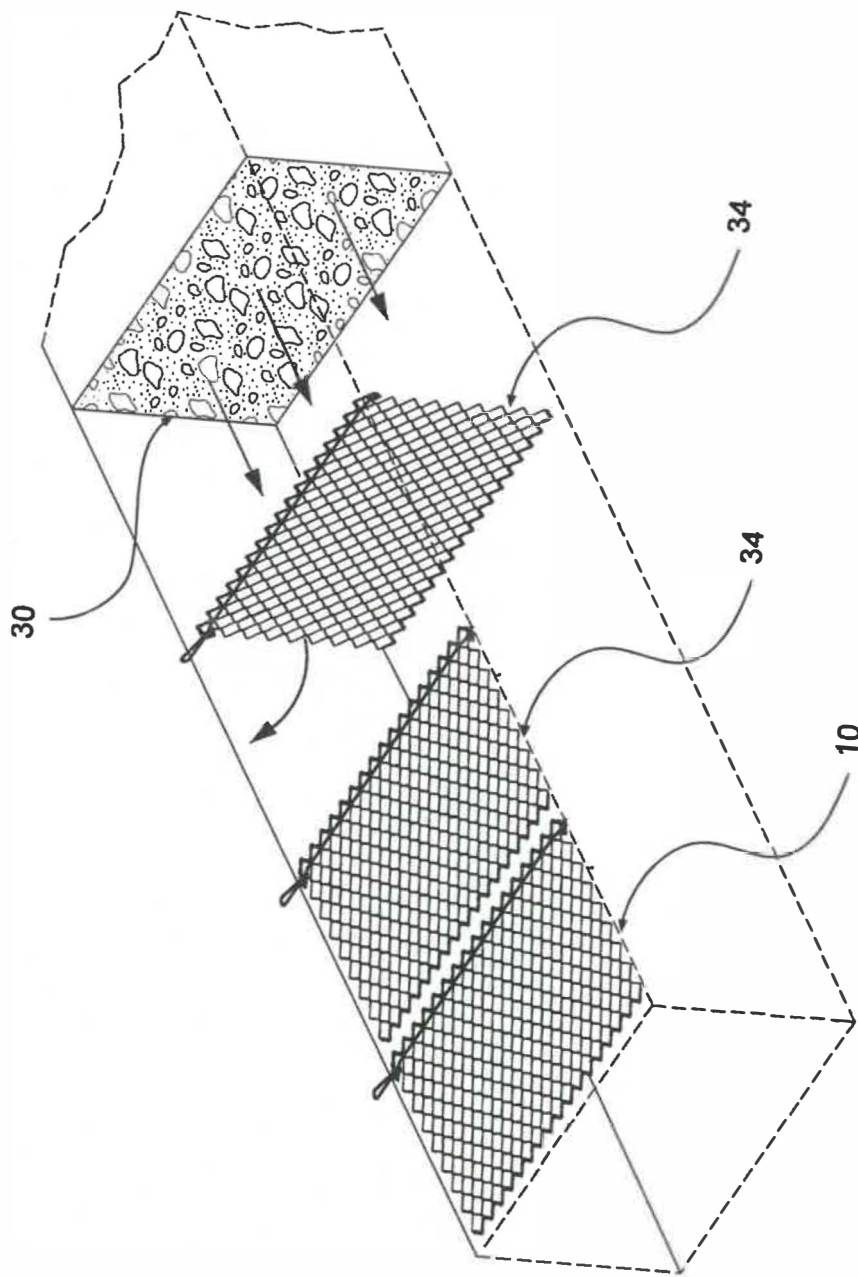


Figure 11