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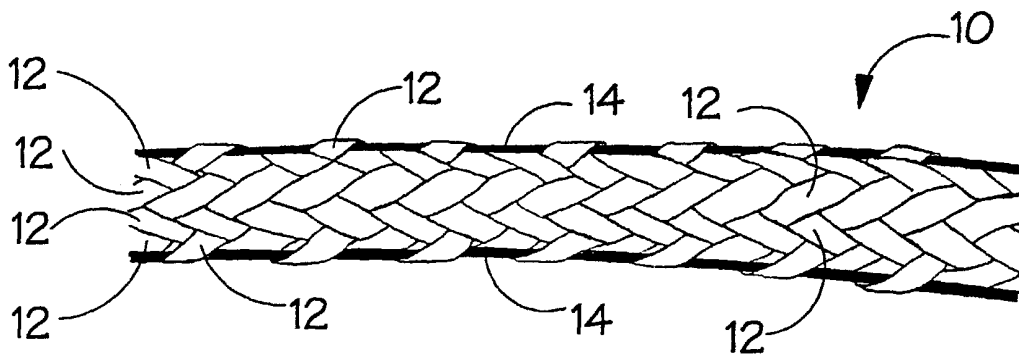
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(54) Title: A LUMINOUS LINE AND A NET INCORPORATING A LUMINOUS LINE



(57) Abstract: The present invention concerns a line incorporating at least one luminous strand, and a net incorporating such a luminous line, the line being formed such that the or each luminous strand is disposed substantially parallel with the longitudinal axis of the line.

A LUMINOUS LINE AND A NET
INCORPORATING A LUMINOUS LINE

The present invention relates to a luminous line
5 particularly, but not exclusively, for use in the
manufacture of a net, for example a fishing net.

Lines, for example rope, cord, string, yarn, cable and
the like, are commonly used on their own or
10 incorporated into a structure such as a net, for
example a fishing net. In some applications, it is
desirable for the line, or the structure of which it is
part, to be visible both day and night. One example is
a cordoning line. Another example is a fishing net -
15 with certain types of fishing net, it is desirable to
make certain portions of the net clearly visible to
fish, or other sea creatures, so that they are diverted
away from the said visible portions towards other
portions of the net.

20 It will be apparent that problems arise at night where,
in the absence of daylight, the line or structure is
barely visible, if at all. In the case of a fishing
net, this problem is compounded by the fact that the
25 net is, during use, under water.

According to a first aspect of the present invention,
there is provided a line comprising a plurality of
strands wherein at least one strand is a luminous
30 strand, said at least one luminous strand being
disposed such as to be at least partially visible along
at least part of the line.

In the context of the present invention, a "luminous" material is defined as a material capable of emitting or reflecting usually steady, suffused or glowing light
5 and capable of being perceived, in use, by, for example, a sea creature. The term "luminous" embraces the term "luminescent" as defined hereunder, which is not limited thereto. Thus, the term "luminous" also embraces emission or reflection of light by, for
10 example, incandescent materials.

Preferably, the line comprises a plurality of interwoven first strands incorporating at least one luminous second strand.

15

The term "interwoven" is defined as forming a yarn by interlacing strands.

More preferably, the line comprises a plurality of
20 interbraided first strands interwoven with the at least one luminous second strand.

The term "interwoven" as used herein embraces, but is not limited to, the term "interbraid" as defined
25 hereunder. Thus, the term "interwoven" also includes the term braid as defined hereunder.

The term "braid", in the context of the present invention, is defined as to interweave three or more
30 strands, or alternatively a cord having usually three or more component strands so as to form a regular diagonal pattern down its length.

More preferably, the or each luminous second strand is interwoven with the plurality of first strands such that the or each luminous second strand is substantially parallel with the longitudinal axis of the line, over at least part of the length of the line.

Preferably, the or each luminous strand is formed by dispersing a luminescent substance in a suitable matrix, for example, a plastics material.

10

The term "luminescent" is defined as the low temperature emission of light, i.e., light emission at an ambient temperature of about -10°C to about 50°C.

15 Preferably, the luminescent substance comprises from about 5 parts to about 50 parts, by weight, to 100 parts, by weight, of the plastics material.

More preferably, the luminescent material comprises from about 5 parts to about 25 parts, by weight, to 100 parts, by weight, of the plastics material.

Most preferably, the luminescent substance comprises from about 10 parts to about 15 parts, by weight, to 100 parts, by weight, of the plastics material.

More preferably, the or each luminous second strand comprises a co-extruded length of the luminescent substance dispersed in the plastics material.

30

According to a second aspect of the present invention there is provided a method of manufacturing a line, the method comprising drawing a plurality of strands

together to form the line, wherein at least one strand is a luminous strand, said luminous strand being at least partially visible along at least part of the line.

5

Preferably, the luminous strand is drawn into the line such as to be substantially parallel with the longitudinal axis of the line.

10 According to a third aspect of the present invention, there is provided a method of manufacturing a line comprising a plurality of first strands and at least one second strand, the method comprising drawing the plurality of first strands and the at least one second
15 strand together to form the line, such that the at least one second strand is substantially parallel with the longitudinal axis of the line and at least partially visible along at least part of the line.

20 Preferably, each first strand is interwoven with each of the remaining first strands and the at least one second strand.

Preferably, the plurality of first strands are
25 interbraided with one another.

A fourth aspect of the present invention provides a net incorporating a line according to the first aspect of the invention.

30

An embodiment of the invention will now be described by way of example and with reference to the accompanying drawings in which:

Figure 1 is a schematic view of a portion of a line according to a first aspect of the present invention;

5

Figure 2 is a schematic view of a weaving apparatus for use in the manufacture of the line of **Figure 1**;

10 **Figure 3** is a sectional view of the portion of the apparatus of **Figure 2** for carrying the material to be interwoven; and

Figure 4 is a plan view of a track plate
15 forming part of the apparatus in **Figure 2**.

Referring now to **Figure 1** of the drawings, there is shown, generally indicated at 10, a portion of a line according to a first aspect of the invention. The line
20 10 comprises a plurality of interwoven strands. In the illustrated embodiment, the line 10 comprises sixteen first strands 12 braided together in conventional fashion; and two second strands in the form of luminous strands 14. The first strands 12 may be formed from,
25 for example nylon, polyethylene, polypropylene, polyester or the like, and may optionally each comprise a plurality of sub-strands (not illustrated) arranged substantially parallel with one another (the number of sub-strands depends on the required strength of the
30 line 10 being formed).

The luminous strands 14 are interwoven with the first strands 12 but, in the preferred embodiment, are not

interbraided therewith. Rather, the luminous strands 14 are interwoven with the first strands 12 such that the strands 14 run substantially parallel with the longitudinal axis of the line 10 and are preferably
5 oppositely disposed on the line 10.

It will be appreciated that the line 10 need not necessarily incorporate exactly two luminous strands 14 but may alternatively incorporate one or more luminous
10 strands 14.

The luminous strands 14 are preferably formed from a plastics material, preferably a thermoplastics material, mixed with a luminescent substance such as
15 alkaline earth aluminate. It will be appreciated that other known luminescent substances, such as ZnS:Cu, are also suitable.

To form each luminous strands 14, a quantity of
20 luminescent substance is mixed with a quantity of molten thermoplastics material and then co-extruded using a conventional extruder (not shown) coupled to a strand-shaped die (not shown) under the normal extrusion conditions which apply to the thermoplastic
25 being used. High density polyethylene is a suitable plastics for this purpose although a skilled person will immediately understand that other plastic materials are also suitable. For example, the luminescent substance is provided at an addition rate
30 of from about 5 parts to about 50 parts, by weight, to 100 parts by weight of the thermoplastics material, preferably from about 5 parts to about 25 parts, and most preferably from about 10 parts to about 15 parts.

Referring now to Figures 2, 3 and 4 there is shown an apparatus 20 for interweaving a plurality of strands. The apparatus 20 is a conventional apparatus such as
5 the five-inch braider as manufactured by Riggs Autopack Limited incorporating J.B. Hyde of Southfield Street, Nelson, Lancashire, England. The components of the apparatus 20 are well known and notably include a track plate 22 which carries a plurality of bobbin carriers
10 24. The track plate 22 is mounted above the plurality of horn gears 26, and incorporates a track 38. The track 38 is comprised of a plurality of arcuate inner sections 40 and outer sections 42 which, in combination, outline a "figure of eight" path around
15 the circumference of the plurality of horn gears 26 situated therebeneath. Referring now to both Figures 3 and 4, each horn gear 26 incorporates four recesses 44, although each horn gear 26 could have any number of recesses 44. Each bobbin carrier 24 projects through
20 the track plate 22, and includes a pair of flanges 46 which engage the track plate 22 at the track 38. Each bobbin carrier 24 further includes a stub 48 which projects downwardly of the track plate 22 and which, in use, is engaged within one of the recesses 44 of a
25 respective horn gear 26.

In use, adjacent horn gears 26 rotate in opposed directions, each carrying at any one time, a pair of opposed bobbin carriers 24 via a respective stub 48
30 engaged within the respective recess 44, as illustrated in Figure 4. Figure 3 shows only one bobbin carrier 24, for ease of illustration. As adjacent horn gears 26 rotate, corresponding recesses 44 pass and

communicate with one another at a respective junction of the pair of inner and outer sections 40, 42 of the track 38, located above said adjacent horn gears 26. As the horn gears 26 are rotating, the bobbin carriers 24 engaged within the recesses 44 are forced radially outward by virtue of the centrifugal force experienced but are retained within the recesses 44 as a result of engagement of the respective pair of flanges 46 within the track 38. However, as the corresponding recesses 44 of adjacent horn gears 26 pass and communicate with one another, the respective bobbin carrier 24 will be forced out of one recess 44 and cross into the recess 44 of the adjacent horn gear 26, and therefore begin rotational translation in the opposed direction, as indicated by the directional arrows shown in Figure 4.

In use, strands 12, such as nylon strands, to be woven are wound onto bobbins (not shown) and then placed on a respective bobbin carrier 24. The free end of each strand 12 is passed through a former 32 whereafter the combined strands are coupled to a collecting mechanism, generally indicated at 34, which, during use, draws the combined strands through the former 32.

In use, as the combined strands are drawn through the former 32 by the collecting mechanism 34, and as hereinbefore described, some of the bobbin carriers 24 are passed in a clockwise direction between adjacent horn gears 26 while the other bobbin carriers 24 are passed anti-clockwise between adjacent horn gears 26. The arrangement is such that the bobbin carriers 24 pass alternately inside and outside, or over and under, one another following a path similar to a figure of

eight. The effect of this is to braid the strands 12 together as they pass through the former 32.

Each horn gear 26 has a hollow axle 28, one end 30 of which projects through a guide aperture 50 formed in the track plate 22. In order to incorporate two luminous strands 14 into the line 10, a pair of opposed guides 36, commonly referred to as warp guides, are coupled to opposed one ends 30 of the hollow axles 28 of two opposed horn gears 26. Each warp guide 36 comprises a hollow tube which, when mounted on the horn gear axle 28, is substantially co-axial therewith. Each warp guide 36 is dimensioned to extend through the guide aperture 50 in the track plate 22 to approximately the level of the take-off points 38 of the bobbin carriers 24.

In the apparatus 20 shown in Figure 2, two warp guides 36 are provided (one for each filament 14). In use, a respective luminous strand 14 is passed through the hollow axle 28 of a respective horn gear 26 and through the respective hollow warp guide 36. The luminous strands 14 are further fed through the former 32 together with the strands 12. Each strand 14 is also coupled to the collecting mechanism 34 so that, during use, it is drawn through the former 32 with the other strands 12.

In the illustrated arrangement, it will be apparent that the warp guides 36 do not pass between adjacent horn gears 26 and that the luminous strands 14 are not therefore rotated around the track plate 22. The bobbin carriers 24 thus revolve around the stationary

warp guides 36 and this has the effect of interweaving the luminous strands 14 with the strands 12 to produce the line 10. However, since the warp guides 36 do not revolve, the luminous strands 14 are not plaited or
5 braided with the other strands 12. Rather, the luminous strands 14 run substantially parallel with the longitudinal axis of at least part of the length the line 10. The overlapping plaits or braids formed by the other strands 12 serve to hold the luminous strands
10 14 in position.

Having the or each filament 14 running substantially parallel with the longitudinal axis of the line 10 is preferred since this arrangement requires less of the
15 strand 14 and is therefore cheaper to produce. It will be appreciated, however, that in an alternative embodiment (not illustrated) one or more luminous filaments may be plaited or braided with the other strands 12. Also, the line 10 need not be a sixteen
20 strand braid as shown in Figure 1. One or more luminous strands 14 can be incorporated into any conventional or non-conventional construction of interwoven strands, for example, a 3, 4, 12, 16 or 24 strand braid (or other interwoven arrangement) may be
25 used. In each case, the or each strand 14 may take the role of one of the strands 12 or may be interwoven in another manner such as the manner described above with reference to the drawings.

30 The line 10 of the present invention is particularly suited for use in the manufacture of nets, particularly fishing nets. Some fishing nets (not shown) are relatively large and complex and it is important to

guide fish, or other sea creatures, into the correct part of the net. However, if the fish cannot see the net, they tend to spread evenly along its entire area so that only some of the fish actually go where the
5 fishermen want them to go. This is particularly a problem at night. A fishing net (not shown), formed in accordance with a second aspect of the invention, has certain portions thereof formed wholly or partly from a luminous line formed in accordance with the first
10 aspect of the present invention. In use, the fish are diverted away from the luminous portions of the net. By careful arrangement of the luminous portions, therefore, the fish can be directed to where the fishermen want them to go.

15

The luminous line 10 of the invention, is particularly advantageous in that the luminescence or luminosity of the strands 14 do not deteriorate with time and will last for the lifetime of the line 10, or net, or other
20 structure.

Claims:

1. A line comprising a plurality of strands
5 wherein at least one strand is a luminous strand, said at least one luminous strand being disposed such as to be at least partially visible along at least part of the line.
- 10 2. A line according to Claim 1 wherein the line comprises a plurality of interwoven first strands incorporating the at least one luminous second strand.
- 15 3. A line according to any preceding claim, wherein the line comprises a plurality of interbraided first strands interwoven with the at least one luminous second strand.
- 20 4. A line according to any preceding claim wherein the or each luminous second strand is interwoven with the plurality of first strands such that the or each luminous second strand is
25 substantially parallel with the longitudinal axis of the line, over at least part of the length of the line.
5. A line according to any preceding claim wherein
30 there or each luminous second strand is formed by dispersing a luminescent substance in a suitable matrix, for example, a plastics material.

6. A line according to Claim 6 wherein the luminescent substance comprises between about 5 parts to about 50 parts, by weight, to 100 parts by weight of the plastics material.
- 5
7. A line according to Claim 5 or 6 wherein the luminescent substance comprises between about 5 parts to about 25 parts, by weight, to 100 parts, by weight, of the plastics material.
- 10
8. A line according to Claims 5 to 7 wherein the luminescent substance comprises between about 10 parts to about 15 parts, by weight, to about 100 parts, by weight, of the plastics material.
- 15
9. A line according to Claims 5 to 8 wherein the or each luminous second strand comprises a co-extruded length of the luminescent substance dispersed in the plastics material.
- 20
10. A method of manufacturing a line, the method comprising drawing a plurality of strands together to form the line, wherein at least one strand is a luminous strand, said luminous strand being at least partially visible along at least part of the line.
- 25
11. A method according to Claim 10 wherein the luminous strand is drawn into the line such as to be substantially parallel with the longitudinal axis of the line.
- 30

12. A method of manufacturing a line comprising a plurality of first strands and at least one second strand, the method comprising drawing the plurality of first strands and the at least one second strand together to form the line such that the at least one second strand is substantially parallel with the longitudinal axis of the line and at least partially visible along at least part of the line.
13. A method according to Claim 11 wherein each of the first strands is interwoven with each of the remaining first strands and the at least one second strand.
14. A method according to Claims 11 or 12 wherein the plurality of first strands are interbraided with one another.
15. A net when formed with a line according to Claims 1 to 9.

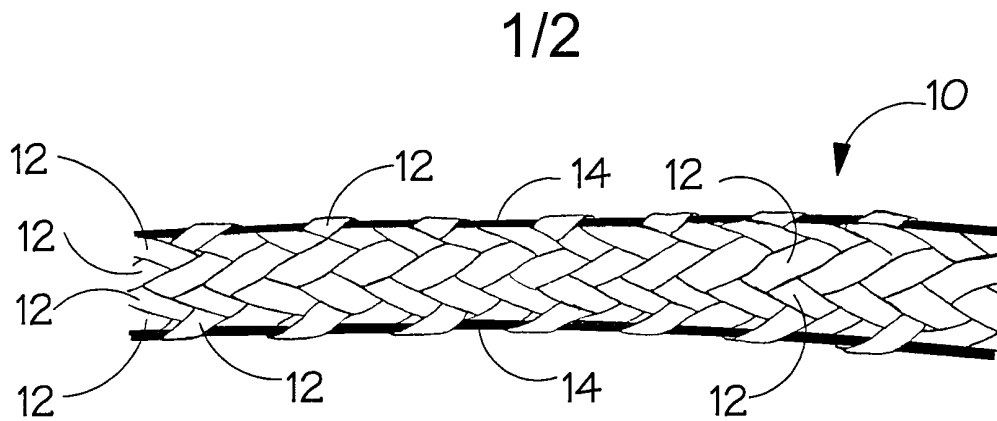


FIG.1.

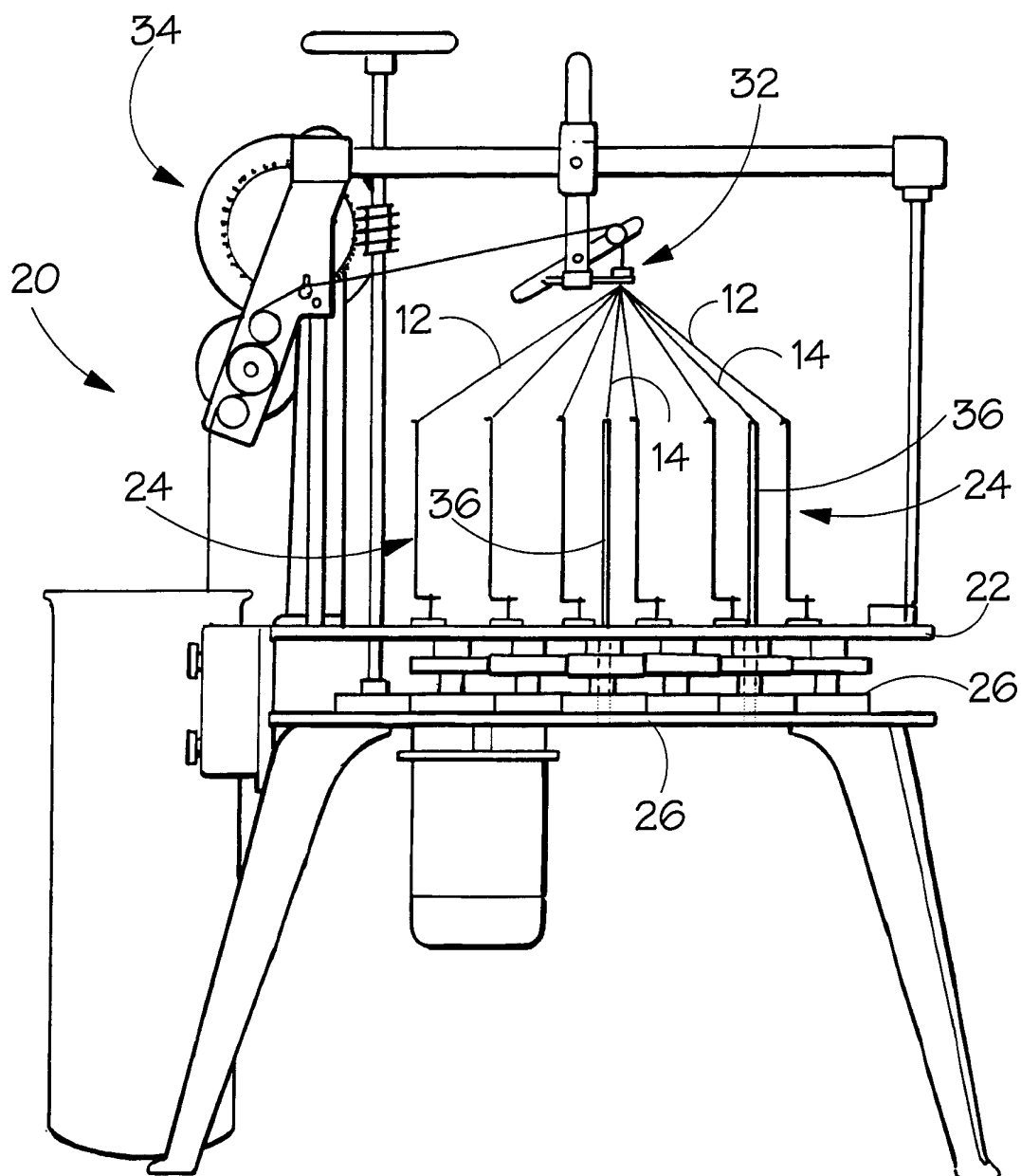


FIG.2.

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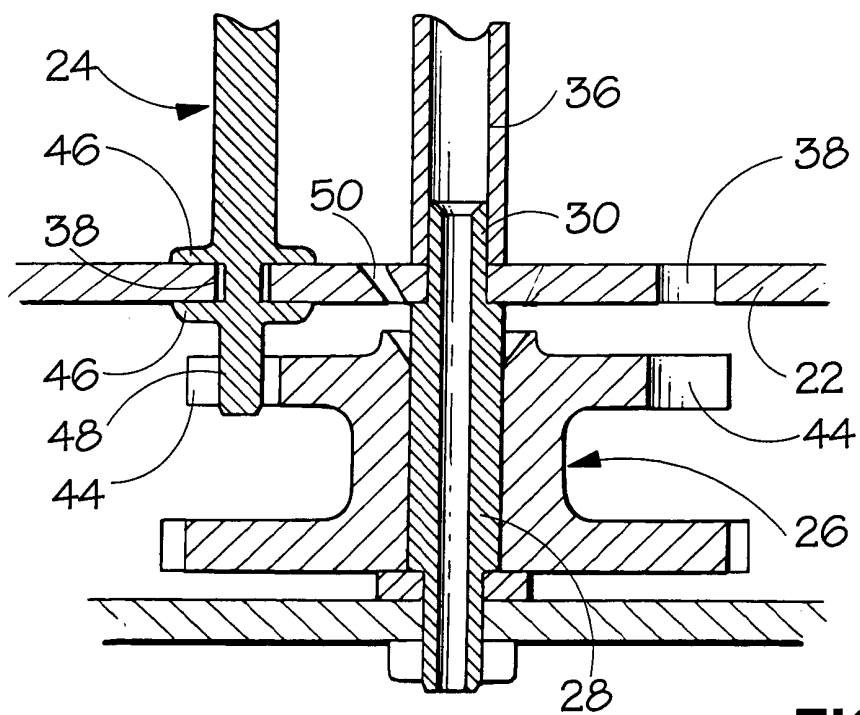


FIG. 3.

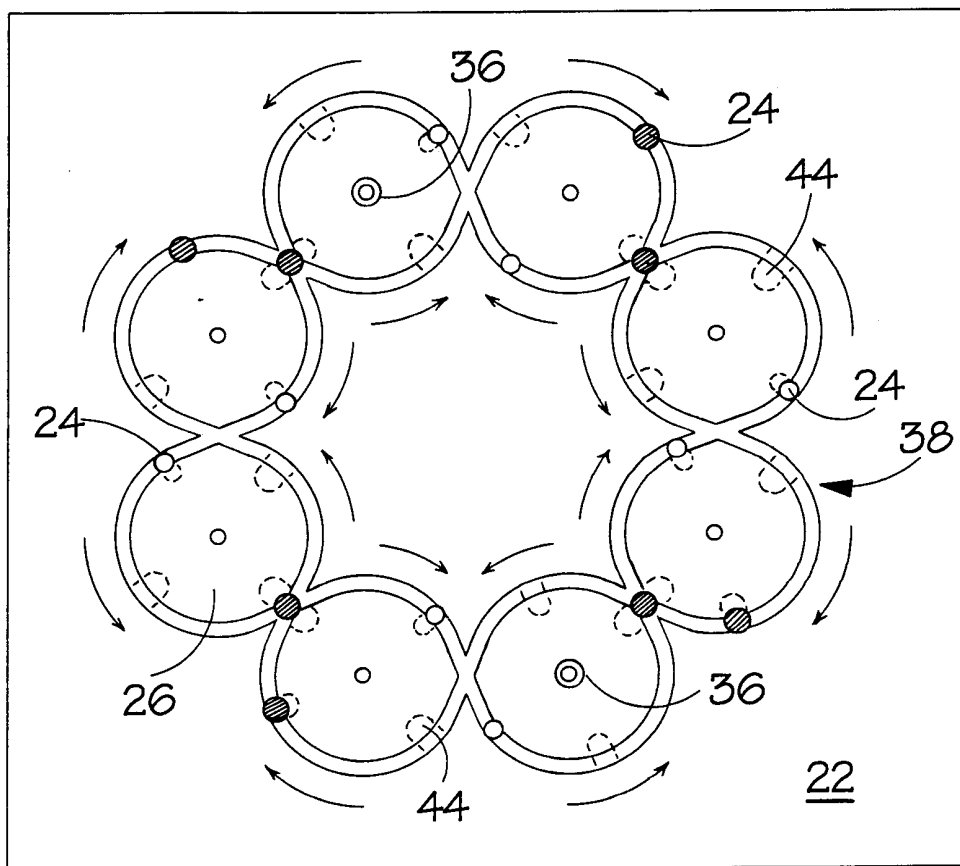


FIG. 4.