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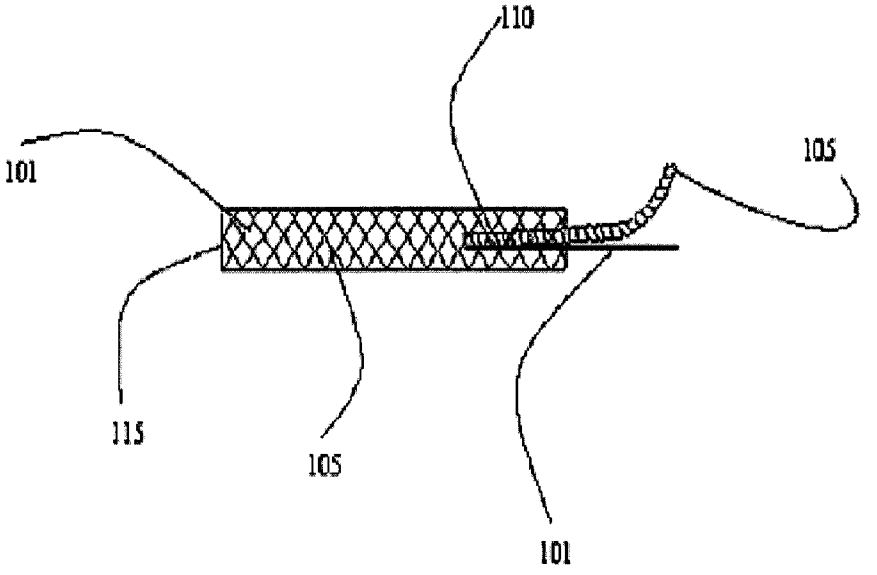
(54) Titre : PROCEDE DE FABRICATION DE FICELLE RIGIDE RESISTANTE AUX COUPURES ET AUX MORDILLEMENTS POUR FILETS DESTINES AUX CAGES D'AQUACULTURE

(54) Title: METHOD OF MAKING CUT AND BITE RESISTANT STIFF TWINE FOR NETTINGS FOR AQUACULTURE CAGES



(57) Abrégé/Abstract:
A method of making twine, which is stiff in nature, the method achieved by a blend of synthetic fiber(s), metal wire(s) and stiffening cum waxy material like hot melt adhesive; the said twine being difficult for a predator like shark, sea lion etc., to bite and cut, thus protecting the aquaculture cage bag and the fish inside it.

ABSTRACT OF THE INVENTION:

A method of making twine, which is stiff in nature, the method achieved by a blend of synthetic fiber(s), metal wire(s) and stiffening cum waxy material like hot melt adhesive; the said twine being difficult for a predator like shark, sea lion etc., to bite and cut, thus protecting the aquaculture cage bag and the fish inside it.

Method of Making Cut and Bite Resistant Stiff Twine for Nettings for Aquaculture Cages

DESCRIPTION:

FIELD OF THE INVENTION

The present invention generally relates to a concept of twine and netting and more particularly to twine and netting, which is stiff in nature; the stiffness achieved by a blend of synthetic fiber(s), metal wire(s) and stiffening cum waxy material like hot melt adhesive. The netting is difficult for a predator like shark, sea lion etc., to bite and cut, thus protecting the aquaculture cage bag and the fish inside it. The stiff material also prevents the predators from pushing in the net towards the cage bag where the fish grow. The hot melt coating also forms a layer over the metal wire prolonging the process of corrosion. The netting is also useful for other applications where stiff netting is needed or can be used directly as an aquaculture cage bag.

BACKGROUND OF THE INVENTION

Fish are grown from fingerlings to large fishes in synthetic net cage bags by periodically feeding them. These are then used for consumption purposes. Some of the species grown in such a manner are Salmon, Cobia, Tilapia, etc. The fish in the aquaculture cage bags are also an easy prey for the predator fish in the ocean like sharks and sea lions. They cut and / or bite the cage bags to eat the fish.

There have been efforts earlier to produce netting with very high strength which can serve the purpose of a boundary wall encompassing the cages in the fish farm. However, the high strength nettings have not proven much successful as the predators can still cut and/or bite in to them due to their sharp teeth.

Efforts are also made to have netting with metal wire along with synthetic fiber(s) in twisted, braided or other forms. However, though they are effective to some extent, these are very soft and the predators can easily push them through.

One such net system is developed by M/s. Net Systems and M/s. DSM Dyneema under the brand Predator - X. Predator-X is a hybrid of Dyneema® high-strength polyethylene fiber(s) and stainless steel wire. This lightweight, flexible, high-strength barrier is based on NET Systems' existing Ultra Cross Knotless Netting platform. However, this net is too soft and flexible. Also the net is costly using HMPE fiber and the uniqueness of its construction.

Another such system is disclosed in United States Patent No. 5967086 titled Aquaculture method and apparatus. This Patent discloses an aquaculture system including an upper support for disposition at the surface of a water body of an aquaculture farm; a cage having a side wall portion and a bottom wall portion, the side wall portion having an upper edge secured to the upper support so as to project below the surface of the water body and the side wall portion being formed out of vertically contractible, non-buoyant mesh; and a lower support disposed between a bottom edge of the side wall portion and an outer edge of the bottom wall portion. The said Patent further discloses a feature - the cage has substantial planar rigidity so as to resist horizontal deformation in response to water creature impact and water currents – which prevents penetration of the cage by predators or deformation of the cage which could cause crowding of retained fish. However, this system is too rigid and also difficult to remove for cleaning of algae. It also damages the fish floating in the sea including the sharks which are a protected species.

There have also been efforts to make thick rigid member nettings of polymers such as PET to avoid predator attacks. However, this system is also too rigid.

In another type of fishing, nettings with hot melt adhesive core without metal wire(s) are used in trawling application as a cod end. The purpose there is to have a less amount of mesh opening to restrict fishes caught in the cod end from slipping away.

Therefore, there exists a long term requirement to have flexible netting with stiff members, which could prevent predators to cut / bite into the net.

SUMMARY OF THE INVENTION

In one aspect of the invention, there is provided a method of making a twine for use in netting for aquaculture, the method including: taking hot melt adhesive in molten form; taking at least one synthetic fiber; passing the at least one synthetic fiber through a trough of the molten adhesive and allowing the at least one synthetic fiber to solidify by cooling at room temperature; taking another set of at least one synthetic fiber; taking at least one metal wire; twisting the at least one metal wire, the another set of at least one synthetic fiber, and the hot melt adhesive coated at least one synthetic fiber together to form a twisted twine.

In another aspect of the invention, there is provided a method of making a twine, the method including: taking at least one metal wire; taking one set of at least one synthetic fiber; twisting the one set of at least one synthetic fiber and the at least one metal wire; taking hot melt adhesive in molten form; passing another set of at least one synthetic fiber through a trough of the molten adhesive and allowing the another set of at least one synthetic fiber to solidify by cooling at room temperature; passing the twisted one set of at least one synthetic fiber and the at least one metal wire into a core of a braided twine along with the hot melt adhesive coated another set of at least one synthetic fiber.

In a further aspect of the invention, there is provided a method of making a twine for use in netting for aquaculture, the method including: taking paraffin wax in molten form; taking at least one synthetic fiber; passing the at least one synthetic fiber through a trough of the molten paraffin wax and allowing the at least one synthetic fiber to solidify by

cooling at room temperature; taking another set of at least one synthetic fiber; taking at least one metal wire; twisting the at least one metal wire, the another set of at least one synthetic fiber, and the paraffin wax coated at least one synthetic fiber together to form a twisted twine.

In yet another aspect of the invention, there is provided a method of making a twine, the method including: taking at least one metal wire; taking one set of at least one synthetic fiber; twisting the one set of at least one synthetic fiber and the at least one metal wire; taking paraffin wax in molten form; passing another set of at least one synthetic fiber through a trough of the molten paraffin wax and allowing the another set of at least one synthetic fiber to solidify by cooling at room temperature; passing the twisted one set of at least one synthetic fiber and the at least one metal wire into a core of a braided twine along with the paraffin wax coated another set of at least one synthetic fiber.

BRIEF DESCRIPTION OF THE DRAWING

The aspects and features of the invention can be better understood with reference to the drawing. The drawing is not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention.

Figure 1 illustrates a schematic diagram of the structure of the twine in accordance with the present invention;

DESCRIPTION OF THE INVENTION

The present invention seeks to overcome the limitations stated in the above cited prior arts. The present invention relates to synergetic usage of cut resistance of metal wire(s), stiffening property of hot melt adhesives and smooth surface and flexible property of synthetic fiber(s).

The present invention relates to manufacturing a twine and netting for predator protection net using the method disclosed herein.

In accordance with the present invention, hot melt adhesive is molten and coated onto a polyolefin or a Polyamide or a Polyester fiber or a Aramid fiber or a Basalt fiber or a LCP fiber or like ("synthetic fiber(s)"). This is done by passing the synthetic fibers through a trough of molten adhesive and allowing it to solidify by cooling at room

temperature. In accordance with the present invention, adhesive such as a hotmelt adhesive used in packaging and sealing which is either singular or a combination of two or more of materials like EVA, PU, metallocene catalyzed polymers, APAO, polyamide and block copolymers is used. In accordance with the preferred embodiment of the present invention, Technomelt® is used as an adhesive.

In a further aspect of the present invention, such hot melt adhesive coated synthetic fiber(s) 101 is twisted together with metal wire(s) and second set of synthetic fiber(s) 105 to form a twisted twine 110 and then knotted netting may be made from it. In accordance with the present invention, synthetic fiber(s) such as Polyethylene filament is used. Further, in accordance with the present invention, metal wire (s) having diameters in the range of 0.05 to 0.75 mm are used. Depending on end user requirement various grades of metal wires can be used e.g. SS 304L or SS 316 or tin coated copper wire or a combination of these. However, it is to be noted that depending upon the strength required in the twisted twine, metal wires of varied diameters can be used.

In a preferred embodiment of the present invention the twisted twine 110 comprising of the synthetic fiber(s), metal wire(s) 105 and hotmelt coated adhesive synthetic fiber(s) 101 are passed through a core of a braided twine 115 and cover is made of a synthetic fiber. This helps to avoid the metal wires coming out on the surface preventing damage to the fish and humans handling the cage.

In yet another aspect of the present invention, the synthetic fiber(s) and metal wire(s) 105 are twisted together first and then passed into core of braided twine 115 along with the hot melt adhesive coated fiber(s) 101. The cover is made of synthetic fiber(s).

In yet another aspect of the present invention, the cover also has metal wire(s) 105 and / or hot melt adhesive coated synthetic fiber(s) 101. This can be used where it is important that the predator fish feel the metal wire and run away immediately.

In an aspect of the present invention, wax e.g. paraffin wax can be used instead of hot melt adhesive.

Experimental data:

Experiment 1 - A twine was made with only polyolefin fibers and another with metal wires and hot melt adhesive coated fibers. It was found that the twine with metal wires and hot melt adhesive coated fibers was very difficult to cut.

Experiment 2 – Netting was made from twine with and without hot melt adhesive coated fibers in the core. Both of these were clamped at one end and bent from another end. 5 kg. weight was placed on the bent end for 10 minutes. After removal of the weight it was observed that the net which did not have hot melt adhesive coated fibers in the core straightened faster than the one with hot melt adhesive coated fibers.

Claims

1. A method of making a twine for use in netting for aquaculture, the method comprising:

taking hot melt adhesive in molten form;

taking at least one synthetic fiber;

passing the at least one synthetic fiber through a trough of the molten adhesive and allowing the at least one synthetic fiber to solidify by cooling at room temperature;

taking another set of at least one synthetic fiber;

taking at least one metal wire;

twisting the at least one metal wire, the another set of at least one synthetic fiber, and the hot melt adhesive coated at least one synthetic fiber together to form a twisted twine.

2. The method as claimed in Claim 1, the method further comprising, passing the twisted twine through a core of a braided twine thus forming a synthetic cover.

3. The method as claimed in Claim 1, wherein the hot melt adhesive is either singular or a combination of two or more materials selected from the group consisting of Ethylene Vinyl Acetale (EVA), Polyurethane (PU), metallocene catalyzed polymers, Amorphous Poly-alpha-olefins (APAO), polyamide and block copolymers.

4. The method as claimed in Claim 1, wherein the at least one metal wire comprises a metal or alloy wire selected from the group consisting of a stainless steel wire, a copper wire, a tin coated copper wire, a zinc wire and a galvanized steel wire.

5. The method as claimed in Claim 1, wherein the at least one metal wire has a diameter in the range of 0.05 to 0.75mm.

6. The method as claimed in Claim 1, wherein the at least one synthetic fiber is comprised of a polyolefin fiber, a polyamide fiber, a polyester fiber, an aramid fiber, a Basalt fiber, or a Liquid Crystal Polymer (LCP) fiber.

7. A method of making a twine, the method comprising:

taking at least one metal wire;

taking one set of at least one synthetic fiber;

twisting the one set of at least one synthetic fiber and the at least one metal wire;

taking hot melt adhesive in molten form;

passing another set of at least one synthetic fiber through a trough of the molten adhesive and allowing the another set of at least one synthetic fiber to solidify by cooling at room temperature;

passing the twisted one set of at least one synthetic fiber and the at least one metal wire into a core of a braided twine along with the hot melt adhesive coated another set of at least one synthetic fiber.

8. The method as claimed in Claim 2 or Claim 7, wherein the braided twine comprises metal wires and/or hot melt adhesive coated synthetic fibers.

9. A method of making a twine for use in netting for aquaculture, the method comprising:

taking paraffin wax in molten form;

taking at least one synthetic fiber;

passing the at least one synthetic fiber through a trough of the molten paraffin wax and allowing the at least one synthetic fiber to solidify by cooling at room temperature;

taking another set of at least one synthetic fiber;

taking at least one metal wire;

twisting the at least one metal wire, the another set of at least one synthetic fiber, and the paraffin wax coated at least one synthetic fiber together to form a twisted twine.

10. A method of making a twine, the method comprising:

taking at least one metal wire;

taking one set of at least one synthetic fiber;

twisting the one set of at least one synthetic fiber and the at least one metal wire;

taking paraffin wax in molten form;

passing another set of at least one synthetic fiber through a trough of the molten paraffin wax and allowing the another set of at least one synthetic fiber to solidify by cooling at room temperature;

passing the twisted one set of at least one synthetic fiber and the at least one metal wire into a core of a braided twine along with the paraffin wax coated another set of at least one synthetic fiber.

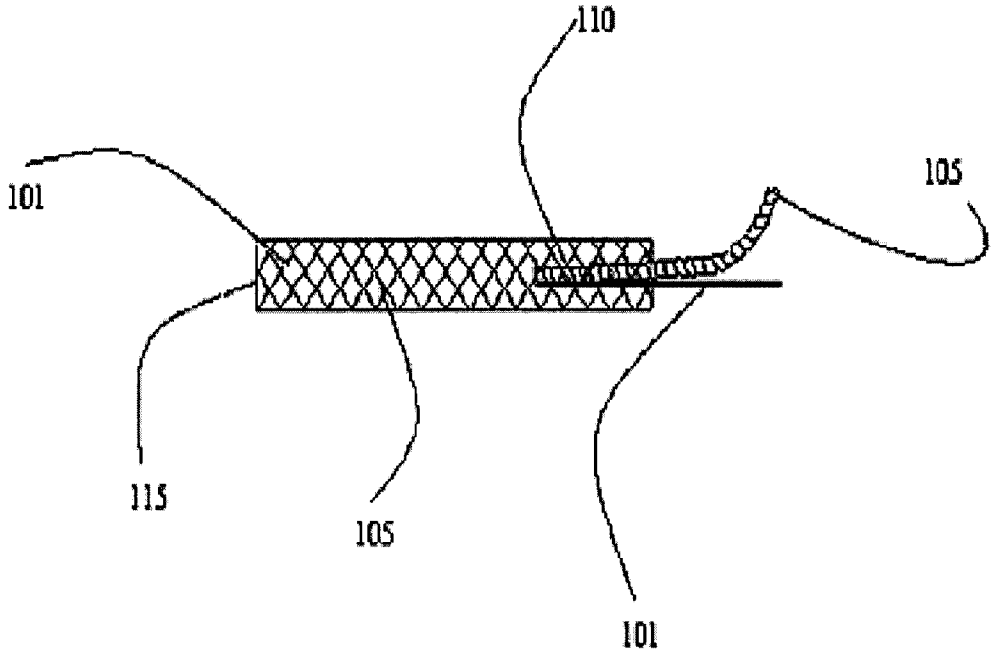
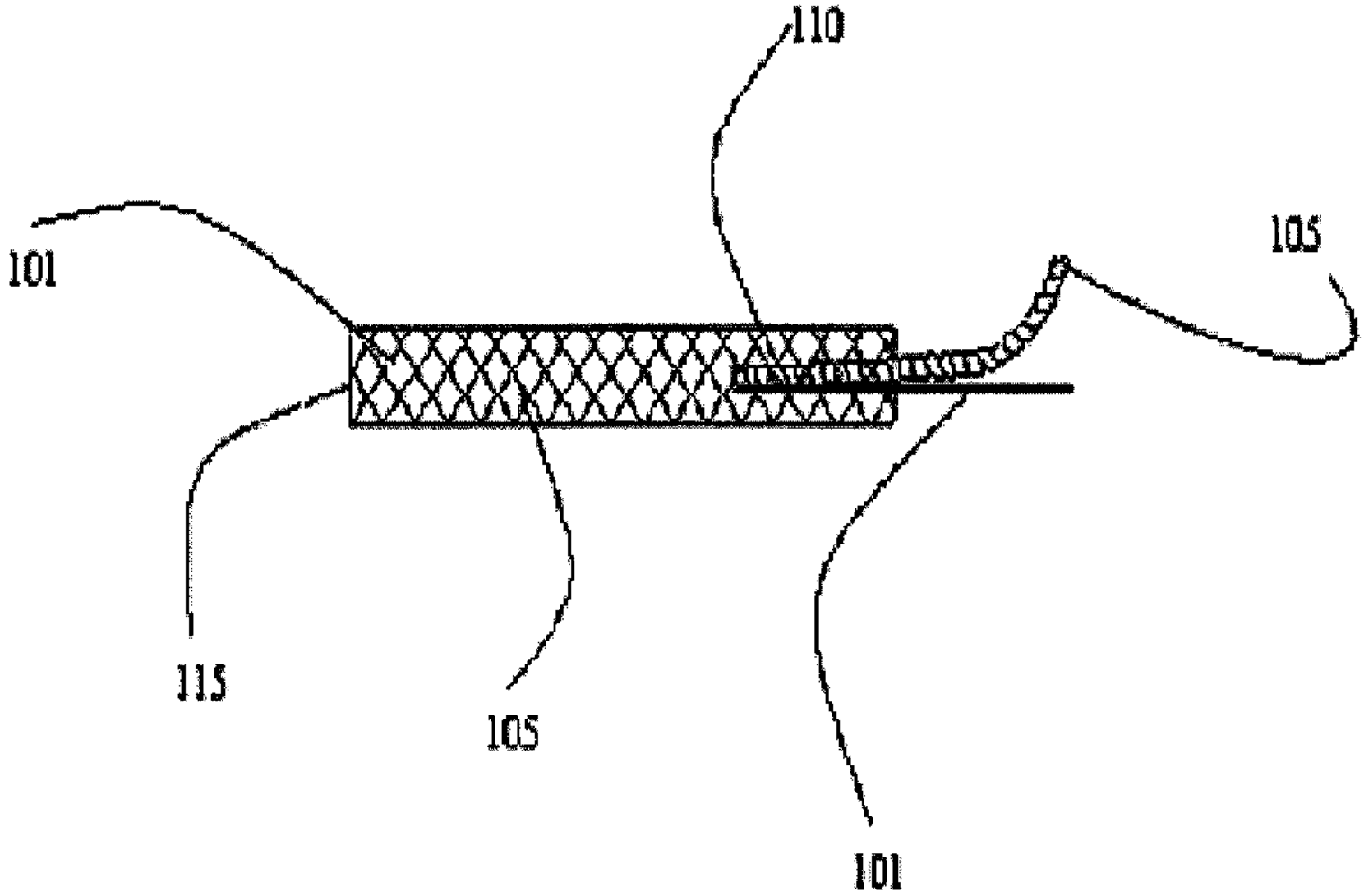


Fig. 1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