United States Patent

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[54] **FLOATABLE CORDS**
6 Claims, 4 Drawing Figs.

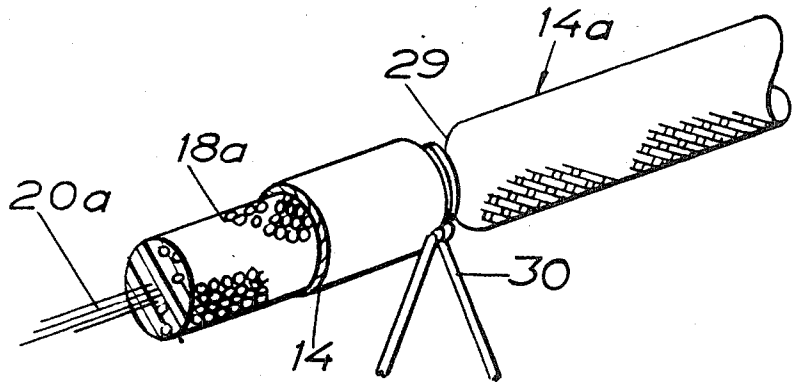
[52] **U.S. Cl.** **87/6,** 43/9, 57/144, 87/7
[51] **Int. Cl.** **D04c 1/12**
[50] **Field of Search** ..... 87/1, 5—8, 9, 23, 28—30; 43/9, 10, 14, 44, 98; 57/144

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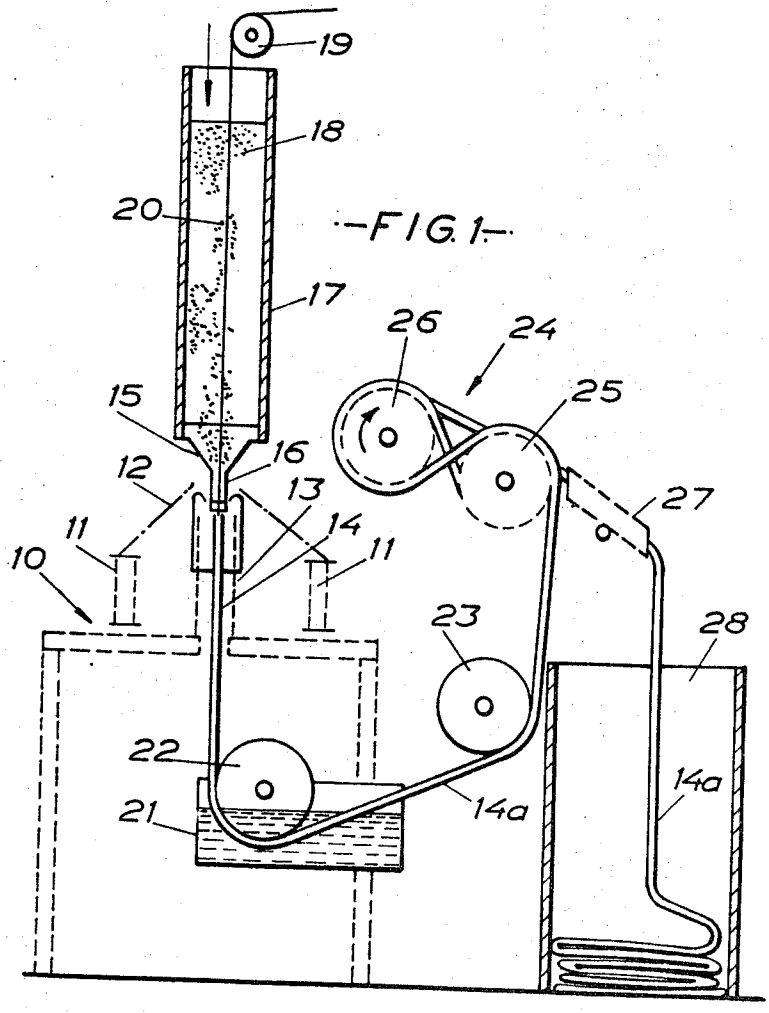
ABSTRACT: A flexible floatable cord for use in fishing nets, trawls, water skiing and the like, which comprises a braided sleeve, a core of continuous filament threads incorporated therein and particles of an expanded plastic material disposed between said sleeve and said core, said particles being only attached to one another and to the sleeve and the core and forming a continuous cord in which the core is embedded. Further a process and an apparatus for producing said flexible floatable cord.



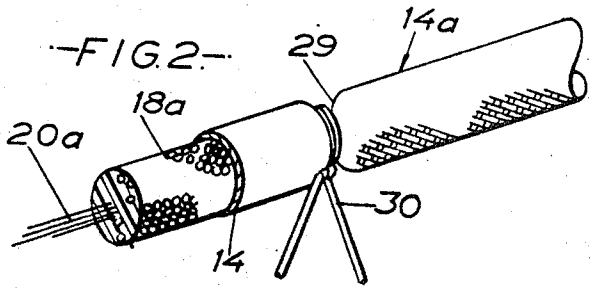
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SHEET 1 OF 2



-FIG. 1-



-FIG. 2-

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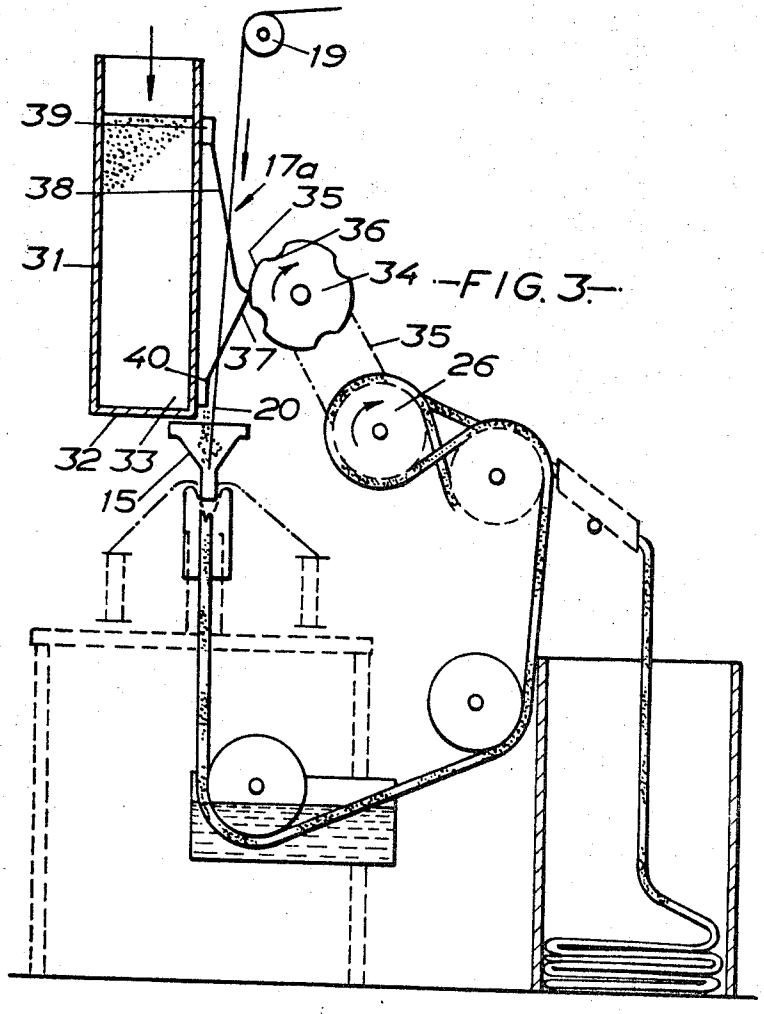


FIG. 3.

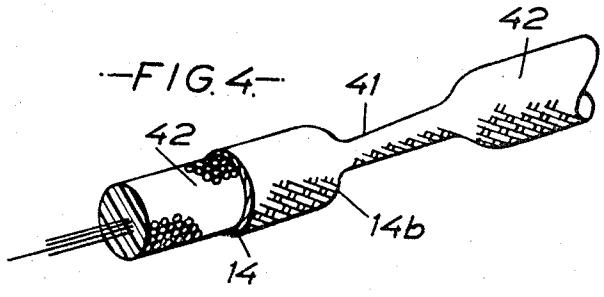


FIG. 4.

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FLOATABLE CORDS

This invention relates to floatable cords and, more particularly, cords for use in fishing nets, trawls and the like.

Floatable cords are known which comprise a continuous, uniformly thick cord of foam plastic or similar material of suitable thickness and specific gravity, which is disposed around a core of synthetic filament threads and is itself enclosed by a braided sleeve of synthetic filamentary material. Such floatable cords are produced by braiding the sleeve in position outside a separately fabricated unit of foam plastic cord and support-forming core.

In practice the net threads and the like can be easily bound to the floatable cord by pursing together the cross section by means of the net thread. In this way there is obtained a reliable fastening for the net threads, so that they can be secured in place in desired positions on the floatable cord. However, there is a disadvantage in that the floatable cord becomes relatively rigid and hence unmanageable in use. This is due essentially to the floatable cord being provided with a continuous, uniformly thick plastic cord which can be bent only with difficulty by small bending radiuses.

It is an object of the invention to provide a supple and flexible, floatable cord which will provide an effective fastening for winding on net threads and the like at desired positions along its length.

According to the invention, a flexible floatable cord for fishing nets, trawls, water skiing and the like comprises a braided sleeve of filamentary material, a core of continuous filament threads incorporated therein and particles of an expanded material disposed between said sleeve and said core, said particles being attached to one another as well as to the sleeve and the core and forming a continuous cord in which the core is embedded.

Conveniently, the braided sleeve is composed of synthetic filamentary material and the core of continuous synthetic filament threads, the latter preferably being fuzzy so that they can be readily charged with static electricity.

The raw material from which the expanded particles are obtained can be a heat-expandable plastic or plasticlike material, such as heat-expandable polystyrene.

The degree of attachment between adjacent expanded particles and between the particles and the walls of the sleeve or the embedded core is such that the particles can be displaced to some extent relative to one another. This state of loose coherence results in a floatable cord possessing good flexibility.

Also according to the invention is a process for producing a flexible floatable cord for use in fishing nets, trawls and the like, which comprises feeding a predetermined quantity of particles of an expandable plastic material directly into a sleeve of filamentary material during braiding thereof and by means of and together with continuous filament threads which form a core, and expanding said particles disposed between said core and the walls of the braided sleeve.

The term "particles" when used in connection with the expression "expandable plastic or plasticlike material" is intended to include powdered and/or granular material.

When the plastic or plasticlike material consists essentially of a heat-expandable polystyrene, it is preferred to heat the composite cord to a temperature just below the fusion temperature thereof, which can be about 80° C.

Further according to the invention is an apparatus for preparing the expandable cord which comprises a braiding machine having a pipe to one end of which filamentary material is fed and from the opposite end of which braided sleeve issues, means for feeding the expandable plastic or plasticlike material and the associated core into the sleeve adjacent said one end of the pipe, and means for drawing the braided sleeve from said opposite end of the pipe.

The feeding means can comprise a container through which the core threads are arranged to pass in contact with the particles of the expandable plastic or plasticlike material present therein, said container having a nozzle adjacent its outlet end projecting into the sleeve.

When it is desired to produce an end product having the aforementioned constrictions in the braided sleeve, the apparatus includes a closure means arranged to be driven synchronously with the drawing means and to close the outlet of the container intermittently, the nozzle being positioned so as to receive predetermined separate doses of the expandable particles issuing from said outlet. Preferably the apparatus also includes a bath for the aqueous mixture comprising the hygroscopic fluid, which is disposed adjacent said opposite end of the pipe to receive the braided sleeve drawn therefrom.

In order that the invention can be more clearly understood, convenient embodiments thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a schematic sketch of an apparatus for use in a first embodiment according to the invention.

FIG. 2 is a perspective view showing details in the composite cord produced according to a first embodiment.

FIG. 3 is a similar sketch to FIG. 1 showing an apparatus for use in a second embodiment according to the invention.

FIG. 4 is a similar sketch to FIG. 2 showing details in the composite cord according to a second embodiment.

In FIG. 1, there is schematically indicated by dotted lines, a braiding machine **10** of a general commercial type for braiding a continuous cord. At **11**, there are shown two of the braiding spools which together with a series of other braiding spools feed filament threads **12** to the mouth of a braiding pipe **13** which extends vertically and centrally through the machine. In the illustrated embodiment the sleeve **14** is drawn vertically downwards through the braiding pipe.

By means of simple provisions as shown by the full lines in the drawing, the above-mentioned braiding machine **10** has been utilized as the basic unit in the apparatus according to the invention. To the braiding machine there is secured, in a manner not shown further, a funnel-shaped, interchangeable feed nozzle **15** having a mouthpiece **16** which projects inwards into the braided sleeve **14**, at the upper end of the braiding pipe. The feed nozzle **15** is connected to a cylindrical storage container **17** for a material **18**, such as powdered, unexpanded polystyrene which is to be introduced into the sleeve. From an upper guide pulley **19**, which is preferably braked by braking means (not shown), there extends a core unit **20** consisting of 2–3 synthetic, fuzzy filament threads. The core unit **20** extends centrally through the container **17** and the feed nozzle **15** and inwards into the sleeve **14** through the mouthpiece **16** and brings with it at the same time a certain amount of material **18** into the sleeve **14**. During this the synthetic filament threads are charged up with static electricity in a manner known per se which is utilized to get the particles in the material **18** mutually to attach themselves to one another and to the core unit **20**. By employing fuzzy filament threads there is obtained an especially good attachment of the particles to the support-forming threads. Vertically below the braiding pipe **13** there is disposed a vessel **21** with fluid and, as illustrated, the line **14*a*** extends over a rotary wheel **22** in the vessel **21**, so that immersion of the line is assured to obtain penetration of fluid into the material **18** in the sleeve **14**, whereby the particles of material can be secured in position in the line in a desired distribution. The fluid in the vessel **21** can consist of a substantially arbitrary hygroscopic fluid mixed with water. From the vessel **21**, the line **14*a*** extends further over an additional rotary wheel **23** and over a drawing arrangement **24** which is standard equipment for the braiding machine **10**. The drawing arrangement **24** consists of a rotary wheel **25** and a driving wheel **26**. From the drawing arrangement the line **14*a*** extends through a chute **27** to a collecting container **28** having perforated walls and base. When a suitable amount of the line **14*a*** is accumulated in the container **28**, this is led to a heated fluid bath (not shown) having a temperature below the fusion temperature (ca. 80° C.) of the polystyrene plastic and is maintained immersed in this for a suitably long period of time, until the polystyrene plastic has expanded to the desired granular size, without the particles

thereby being fused together with one another to any substantial degree. After this heat treatment, the expanded polystyrene plastic particles should be secured in position in the sleeve with a certain attachment to adjacent particles and the sleeve **14** together with the core **20***a*, but nevertheless not with a stronger attachment than that the particles can be displaced to a certain degree relative to one another, so that there is obtained a relatively large flexibility for the line **14***a*.

In FIG. **2**, there is illustrated a floating body or a line **14***a* produced on the above-described apparatus. The floating body or line **14***a* consists of a woven sleeve **14** which surrounds a continuous cord **18***a* of expanded polystyrene foam plastic **18**, in which the core **20***a* is embedded. At **29** there is shown a constriction of the line **14***a* by means of net thread **30** which is bound firmly to the line **13**.

In FIG. **3**, there is illustrated an alternative solution for the apparatus as shown in FIG. **1**. The essential departure from the construction according to FIG. **1** is that the container **17** is replaced by a dosing arrangement **17***a*. In FIG. **3**, there is illustrated a cylindrical storage container **31** having a closed bottom end **32** and a lateral opening **33** which emerges just above the feed nozzle **15** and just at the side of the core unit **20** which, in this case, extends directly from the pulley **19** and downwards into the feed nozzle **15**. The opening **33** is opened and closed by means of a cam wheel **34** which is driven by a chain drive **35** from the driving wheel **26** and which is provided with cam peaks **35** and cam depressions **36** which cooperate with a nose **37** on a spring arm **38**. The arm **38** is secured to the container **31** at the upper end **39**, while at the lower end it supports a closing element **40**, which in the position illustrated in FIG. **3**, is maintained against the opening **33** by means of a cam peak **35** on the cam wheel **34**. On rotating the cam wheel, the nose **37** is brought by means of the spring pressure of the arm **38** inwards into a cam depression **36**, so that the element **40** is removed from the opening **33** and there passes outwards into the nozzle **15**, a definite amount of material from the container **31**. By means of the core unit **20**, this quantity of material is led into position in the sleeve **14** separated from a previous and a subsequent dose quantity of material **18**.

In FIG. **4**, there is illustrated a line **14***b* produced according to the apparatus in FIG. **3**. By means of the above-mentioned dosage of unexpanded polystyrene in the sleeve **14**, local constrictions **41** are obtained along the line between pieces **42** of foam plastic cord, after the heat treatment has been effected which results in expansion of the foam plastic. By means of the local dosages of the foam plastic material, there is obtained by this marked constrictions **41** which can easily have net thread bound thereon.

In practice it has been difficult to maintain a desired accurate temperature just below the fusion temperature of the polystyrene plastic, but if this temperature is exceeded somewhat with the construction according to FIG. **4**, rather stiff cord pieces are indeed obtained, while procuring nevertheless a sufficiently large flexibility at the said constrictions **41**.

In certain cases, certain portions of unexpanded polystyrene from the dosage arrangement **17***a*, as shown in FIG. **3**, can each be dosed and between each such dosing certain portions of expanded foam plastic particles or other unexpandable plastic particles or other filling material an be dosed from another corresponding dosing arrangement. In this way, certain constrictions in the line are obtained correspondingly as above but, besides, there are mutually freely disposed particles which confer great flexibility on the line at the constriction and at the same time fill out the sleeve at these portions to a certain degree.

According to a second case it is possible to obtain such marked constrictions in the line by deforming the sleeve in advance of the heat treatment in an arbitrarily suitable manner, for example by local welding of opposing sleeve walls.

I claim:

1. A flexible floatable cord for fishing net, trawls, water skiing and the like which comprises a braided sleeve of filamentary material, a core of continuous filament threads incorporated within said sleeve and particles of an expanded plastic material disposed between said sleeve and said core, said particles being loosely attached to one another as well as to the sleeve and the core so that the particles can be displaced to some extent relative to one another and forming a continuous cord in which the core is embedded.

2. A cord according to claim **1**, wherein the braided sleeve is composed of synthetic filamentary material.

3. A cord according to claim **1**, wherein the core is composed of continuous synthetic filament threads.

4. A cord according to claim **1**, in which the particles of the plastic material are heat expanded.

5. A cord according to claim **4**, wherein the heat-expanded material is a polystyrene.

6. A cord according to claim **1**, wherein the expanded plastic material is a mixture of expanded foam plastic particles and filler material.