

(19)



**Octrooi Centrum  
Nederland**

(11)

**2019708**

**(12) B1 OCTROOI**

(21)

Aanvraagnummer: **2019708**

(51)

Int. Cl.:  
**A01G 33/00 (2017.01)**

(22)

Aanvraag ingediend: **12/10/2017**

(30)

Voorrang:  
**12/10/2016 NL 2017612**

(73)

Octrooihouder(s):  
**IHC Holland IE B.V. te Sliedrecht.**

(41)

Aanvraag ingeschreven:  
**16/04/2018**

(72)

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(43)

Aanvraag gepubliceerd:  
**23/04/2018**

(47)

Octrooi verleend:  
**04/05/2018**

(74)

Gemachtigde:  
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(45)

Octrooischrift uitgegeven:  
**14/05/2018**

(54)

**Seeding Device for Seaweed**

(57)

A seaweed seeding device for wrapping seaweed rope around a main rope comprises a frame; a friction wheel rotatably connected to the frame to receive the main rope around the wheel and rotate as the main rope is pulled through the device; a bobbin carrier rotatably connected to the frame around an axis of rotation; a seaweed exit guide connected to the bobbin carrier offset from the axis of rotation; and a transmission connecting the friction wheel to the bobbin carrier to translate rotational movement of the friction wheel to rotate the bobbin carrier.

## Seeding Device for Seaweed

### Field of the invention

The present invention relates to a seaweed seeding device, and methods for seeding  
5 seaweed.

### Background art

When cultivating seaweed, seaweed ropes or seeds are typically connected to or wrapped around a main substrate rope which is used to retain seaweed in a fixed place for  
10 growth until ready for harvest. This is commonly called “twine seeding.” Often, a further rope or wire is wrapped around the seaweed line and the main rope to hold them together. A number of different devices are available for fixing the seaweed rope or seeds to the main substrate rope. KR101237156 discloses a method and device for twine seeding a rope with a seedling line, which involves using a fix rope to wrap around the main substrate rope and  
15 seedling line. The system uses a number of pulleys and rollers driven by a motor for movement through the system and for adhering the fix rope around the rope and seedling line. Another similar system is shown in KR20130053643, which winds a binding rope around a seedling line and a rope for binding them together. The rope and seedling line are fed through a main pipe, and a pulley driven by a motor rotates around the rope and seedling  
20 line as they exit the pipe to bind them together. Each of these require motors to drive the various parts of the devices for proper binding using a fix or binding rope around the main rope and seaweed line. Because motors are required, the devices are more prone to mechanical failures and cannot survive harsh or underwater conditions as well.

Twine seeding is a costly and time-consuming process, which typically involves a  
25 hatchery phase, where seedlings are attached to the seaweed line. This usually takes about six weeks and requires a heavily controlled environment.

### Summary

According to a first aspect of the invention, a seaweed seeding device for wrapping  
30 seaweed rope around a main rope comprises a frame; a friction wheel rotatably connected to the frame to receive the main rope around the wheel and rotate as the main rope is pulled through the device; a bobbin carrier rotatably connected to the frame around an axis of rotation; a seaweed exit guide connected to the bobbin carrier offset from the axis of

rotation; and a transmission connecting the friction wheel to the bobbin carrier to translate rotational movement of the friction wheel to rotate the bobbin carrier.

This provides for a seaweed seeding device which does not require electric driving means, and thereby can perform at the highest efficiency even in harsh environments and/or  
5 underwater conditions. Using a transmission to connect and translate rotational movement through the device can also provide a cheaper and more reliable system, as there are fewer vulnerable parts needing checking and maintenance throughout the working life. The use of a frame allows the device to easily be placed on or connected to other devices or vehicles for easy transport before and/or during a seeding operation.

10 According to an embodiment, the device further comprises a bobbin connected to the bobbin carrier. Connecting a bobbin to the bobbin carrier can allow for easy connecting of seaweed to the device for wrapping as the main rope exits the device. Bobbins with seaweed can be grown elsewhere and then connected to the bobbin carrier ready for wrapping. Multiple bobbins may be used to wrap long pieces of seaweed.

15 According to an embodiment, the transmission comprises a gear train. Optionally, the transmission comprises a plurality of sets of gears to increase the rotational speed from the friction wheel to the bobbin carrier. The ratio of seaweed to main rope or density of seaweed line around the main rope can be adjusted using a transmission with a plurality of gears. Gears tend to have the lowest friction of transmission varieties, and thus would  
20 provide a reliable low-friction form of translating rotary motion from the friction wheel to the bobbin carrier.

According to an embodiment, the bobbin carrier comprises a front face, and the seaweed exit guide extends from the front face of the bobbin carrier. Such a design can provide a stable and effective way to wrap a seaweed line around the main rope.

25 According to an embodiment, the device further comprises a guiding wheel to guide the main rope between the friction wheel and the bobbin carrier. This can help to ensure an optimal angle between the angle of attack of the main rope and the direction of seeding, for example ninety degrees. A guiding wheel can be a low-friction way of providing this guide.

According to an embodiment, the frame comprises a plurality of slots to  
30 accommodate different feeding heights of the main rope into the frame. Multiple slots can also accommodate different friction wheel diameters. Different diameters can be used to vary the seaweed rope to main rope ratio.

According to an embodiment, the bobbin carrier further comprises one or more counterweights. The one or more counterweights can help to balance out the bobbin carrier, countering the weight of the seaweed exit guide and/or the bobbins, thereby decreasing the force required for rotating the bobbin carrier.

5        According to an embodiment, the device is formed of anti-corrosion material. The material can be a polymer, for example, Nylon or metals such as Aluminum and/or alloys. This can help to ensure longevity of the device even in corrosive environments, such as at sea and/or underwater. These materials can also provide for relatively easy production and/or construction.

10       According to an embodiment, the friction wheel comprises a high friction surface coating. The high friction surface coating can include, for example, a resin and at least an aggregate. A high friction coating can allow for fewer wrappings around the friction wheel, for example, three instead of four.

      According to an embodiment, the friction wheel comprises one or more rope guides.  
15       Such rope guides can help aid the rope over the friction wheel and/or lift the rope from the friction wheel such that it can move sideways along the friction wheel.

      According to an embodiment, the bobbin comprises a seaweed rope exit guide extending in a direction parallel with the axis of rotation. This can help to properly guide the seaweed line around the main rope as it exits the device and help to form the optimal  
20       angle between the seaweed line and the main rope.

      According to an embodiment, the bobbin carrier comprises a hollow shaft through the axis of rotation to receive the main rope after winding around the friction wheel, with the hollow shaft acting as an exit for the main rope from the device. The hollow shaft can provide for an exit of main rope at an effective position for wrapping seaweed around.

25       According to an embodiment, a vessel or underwater vehicle comprises the device of any of the preceding claims. The frame of the device can allow for easy connection to or on a vehicle or vessel. Vehicles or vessels can provide for a easy way to move the device for stringing the rope and seaweed line for cultivation.

      According to a further aspect of the invention, a method of wrapping seaweed  
30       around a main rope comprises feeding a main rope into a seaweed wrapping device around a friction wheel a plurality of times and out a hollow shaft of a bobbin carrier; connecting a seaweed rope from a bobbin on the bobbin carrier to the main rope exiting the hollow shaft; and pulling the main rope through the device. The bobbin carrier connects to the

friction wheel such that rotation of the friction wheel rotates the bobbin carrier causing the seaweed rope exiting the bobbin to wrap around the main rope. Such a method provides for a simple way of effectively and controllably wrapping a seaweed line around a main rope for cultivation. The use of a friction wheel connected to a bobbin carrier allows for the wrapping of the seaweed line around the main rope without electrical driving means, allowing for an effective device that does not need a lot of maintenance and can withstand harsh conditions.

According to a further aspect of the invention, a machine to seed seaweed lines is disclosed. The machine can perform a method of direct seeding. The machine can include a drum, rope guiding and/or pressing devices to achieve a high and constant seeding

### Short description of drawings

The present invention will be discussed in more detail below, with reference to the attached drawings, in which

Fig. 1A shows a perspective view a seaweed seeding device;

Fig. 1B shows a side view of the seaweed seeding device of Fig. 1A;

Fig. 1C shows a front view of the seaweed seeding device of Fig. 1A;

Fig. 1D shows a cross-sectional view from the top of the seaweed seeding device along line D-D;

Fig. 2A shows a perspective view of a second embodiment of a seaweed seeding device for direct seeding; and

Fig. 2B shows a top view of the seaweed seeding device of Fig. 2A.

### Description of embodiments

Fig. 1A shows a perspective view seaweed seeding device 10 with main rope 11 and seaweed line 12, Fig. 1B shows a side view of the seaweed seeding device 10; Fig. 1C shows a front view of the seaweed seeding device 10; and Fig. 1D shows a cross-sectional view from the top of the seaweed seeding device 10 along line D-D.

Seaweed seeding device 10 includes frame 13, friction wheel 14 (with rope guides 15), transmission 16 with gears 18, bobbin carrier 20 with face 21 and hollow shaft 22, seaweed exit guide 24, bobbin 26, guide wheel 27, rope inlet slots 28 and counterweights 30.

Frame 13 supports the various parts of seaweed seeding device 10, and can be a substantially open frame or could include side walls. Frame 13 includes one or more slots or openings 28 to feed main rope 11 into device to friction wheel 14. The slots or openings 28 can be located at different heights to accommodate different drum and/or winch sizes and placements. Frame 13 and other components can be made of various materials, including but not limited to, polymers, for example, Nylon; wood and/or metals such as Aluminium (including alloys). A material with anti-corrosion properties can be used to provide an increased lifespan, particularly when the device is used in corrosive environments such as under-water.

Friction wheel 14 connects to frame 13 and can rotate with respect to frame 13. Friction wheel 14 can be various sizes but is wide enough for main rope 11 to wrap around friction wheel 14 a number of times. The number of times can vary, but can be, for example, 2-10 times to ensure that sufficient friction is generated to rotate wheel 14 as rope 11 moves through device 10. Friction wheel 14 can be coated, for example, with a high friction surface coating, for example, comprising a resin and an aggregate. Such a coating would allow for fewer wraps of rope around friction wheel 14 without decreasing effectiveness.

Transmission 16 comprises a plurality of gear sets 18 which are connected to frame 13, and also connect friction wheel 14 to bobbin carrier 20. The connection to friction wheel 14 is through a common shaft between friction wheel 14 and a gear 18, as can be seen in Fig. 1D. In the embodiment shown in Figs. 1A-1D, transmission 16 includes three gear sets 18 forming a gear train. This increases the initial rotational speed of friction wheel 14 twenty-eight times. Other embodiments can use more or fewer gear sets, or other modes of transmission, for example belts or chains. By using a gear train, transmission 16 is able to translate and increase the rotary motion of the friction wheel 14 to bobbin carrier 20. This increase can vary depending on the desired wrapping of rope 11 with seaweed line 12.

Bobbin carrier 20 connects to frame 13 and rotates around axis of rotation R. In device 10, bobbin carrier 20 is on an outside of frame 13 in device 10, though in some embodiments could be within frame 13. Bobbin carrier 20 includes hollow shaft 22 which aligns with axis of rotation R. Bobbin carrier 20 also includes a seaweed exit guide 24 which connects to bobbin carrier 20 at a position offset from axis of rotation R. This allows seaweed exit guide 24 to rotate around axis of rotation R when bobbin carrier 20 is rotating. Bobbin 26 holding seaweed line 11 can also be located on bobbin carrier 20, as shown in device 10 or bobbin 26 could be located at a different position, and simply feed seaweed

line 12 to seaweed exit guide 24 for wrapping. Counterweights 30 are also located on bobbin carrier 20 to counterbalance the weight of seaweed exit guide 24 and/or bobbin 26 on bobbin carrier 20.

One or more guides 15 can be used for aiding main rope 11 over friction wheel 14. Additionally, one or more guide wheels 27 can be used to help guide and maintain tension in main rope 11 when moving through device 10 from friction wheel 14 to exiting device 10. Guide wheel 27 can be used to ensure an optimal angle for the seeding line around main rope 11, for example, ninety degrees between the seeding line angle of attach and the direction of the seeding. Different rope diameters can be accommodated and seeded by simply changing the drum size and/or position.

To prepare for use of device 10, main rope 11 is fed into device 10 through opening 28, and can be guided by guide 15 to wrap around friction wheel 14 a plurality of times. Next main rope 11 extends around guide wheel 27 and out the centre of hollow shaft 22 in bobbin carrier 20. Seaweed line 12 is wrapped around bobbin 26, and an end extends from seaweed exit guide 24. The end of seaweed line 12 can be attached to main rope 11, for example through a simple knot.

Main rope 11 and seaweed line 12 are now ready for use in setting up seaweed lines for cultivation. Main rope 11 (with seaweed line 12 connected) can be pulled from the main rope exit of device 10 at hollow shaft 22 to a location where it will be connected for cultivating the seaweed. As main rope 11 is pulled, it moves through device 10. The movement of main rope 11 around friction wheel 14 rotates friction wheel 14, which translates to rotation of bobbin carrier 20 through transmission 16. Due to gears 18, rotational motion is also increase from friction wheel 14 to bobbin carrier 20. As seaweed line 12 is connected to main rope 11, it also moves with the movement of main rope 11, only is wrapped around main rope 11 (in spiral) due to the rotational motion of bobbin carrier 20 around main rope 11 exiting through hollow shaft 22. The increased rotary motion of bobbin carrier 20 as compared to friction wheel 14 results in more dense wrapping of seaweed rope 12 around main rope 11.

The movement of main rope 11 through and from device could also be caused by moving device 10 after having connected main rope 11 to a set point for cultivation (instead of moving rope 12 as described above). In such an embodiment, device 10 could be located on a vessel, an underwater vehicle, or any other apparatus which allows for movement of device 10 to desired locations.

The use of device 10 with friction wheel 14 connected to bobbin carrier 20 through a transmission allows for a simple and effective way of wrapping a seaweed line 12 around a main rope 11 for cultivation. By using a friction wheel 14 and translating the rotary motion of the friction wheel 14 to bobbin carrier 20, device 10 can effectively wrap a seaweed line 12 around a main rope 11 without the use of an electric driving system, such as a motor. This allows the device 10 to effectively work, even in harsh environments such as underwater. The lack of requirement for an electric driving means makes the device easier and less costly to maintain as well, resulting in an overall longer workable life. The size and design with frame 13 make device 10 easily transportable, allowing for use on or with a number of different vessels or vehicles. Additionally, the simple design allows for components which could be easily disassembled and reassembled, making for easy transportation and/or shipping before and/or between uses. The use of a transmission 16 which is flexible to change the rotary motion as desired by using more or fewer gear sets 18 provides a great deal of control of the wrapping to obtain the desired wrapping density at the output. The use of counterweights 30 on bobbin carrier 20 also helps to balance seaweed exit guide 24 and/or bobbin 26 on bobbin carrier 20, thereby decreasing the force needed for rotating bobbin carrier 20.

The ability to use device 10 in submerged environments can result in the ability to use device 10 and string lines even in harsh conditions. In harsh weather conditions, such as during strong wind, current and/or waves, device 10 could be submerged mitigating the impact of the conditions, and rope 11 with seaweed line 12 could still be strung.

Fig. 2A shows a perspective view of a second embodiment of a seaweed seeding device 40 for direct seeding; and Fig. 2B shows a top view of the seaweed seeding device 40. Seaweed seeding device 40 includes bath frame 42, drum 44 and press rollers 46. Also shown is drum 48 holding main rope 50.

Bath frame 42 holds a bath of glue, binding agent and/or adhesive and seaweed seeds. Drum 44 is disposed therein. Rope 50 is wound around drum 44, one or more times, where it will be exposed to the seeds and glue. The seaweed seeds and glue will adhere to rope 50 as it leaves drum, and rope 50 then goes through press rollers 46 to help ensure seaweed seeds stay adhered to rope 50. Any excess seaweed seeds and glue can be returned to device 40 through a collection and transport system or any other means. Rollers 46 can be two wheels pressing together or other roller means. Device 40 provides a simple way of

connecting seaweed seeds to a rope 50 for cultivation of seaweed using the direct seeding method.

As can be best seen in Fig. 2A, a guiding element 52 is provided to guide the rope when it exits the bath frame 42 of seaweed seeding device 40. Guiding element 42 is  
 5 releasably connected to bath frame 42 by any suitable means, for example, a snap fit joint. A similar guiding element can be provided to guide the entrance of rope 50 into bath frame 42 and/or around drum 44. . It should be noted that the guiding element 52 can also act as  
 10 act as a funnel to guide the excess of seeds and/or glue to return to the bath frame 42. In this manner, the quality of the seeding process can be optimal and constant. The control of retention time of a rope section in bath 42 and around drum 44, and of force of the pressing rolls help to ensure the final quality of the seeding process.

Drum 44 comprises a plurality of slats extending in a substantially radial direction and provided with a contact surface on the side towards the direction of rotation. The slats are provided with a slope of about 10-20% with respect to the radial direction. In this  
 15 manner, the rope 50 will homogenously absorb the right amount of the mix of glue, binding agent and/or adhesive and seaweed seeds, while the number of windings is minimized. Moreover, by having this configuration, the seeding speed can be at least 1 km of rope per hour, while the space needed for this operation is minimized. This results in a compact and reliable seaweed seeding device 40.

The skilled person will appreciate that said glue, binding agent or adhesive is a  
 20 substance which attaches two or more elements to each other at the level of the respectively contacting surfaces. This offers the advantage that said glue, binding agent or adhesive promotes the adhesion of algae or seaweed to the rope 50. Said glue or adhesive can be applied separately, in advance onto said rope 50 or can be added to the bath of glue, binding  
 25 agent and/or adhesive, which will also be comprising seedlings of algae or seaweed into the seaweed seeding device 40. A suitable glue, binding agent or adhesive may comprise a polymer, for example, methyl cellulose. Optionally, said glue, binding agent or adhesive is a bio-adhesive. This bio-adhesive material will be diluted once the algae or seaweed is directly connected to the rope directly. This can happen once this algae or seaweed grows  
 30 holdfasts that are directly connected to the yarns of the rope 50.

It should be noted that direct seeding comprises seaweed seedlings that are mixed into a glue suspension, and can be directly applied to the substrate line, eliminating the hatchery phase. This line can be immediately deployed in the field to allow seaweed to

further grow until harvesting. If the glue is bio-degradable it will eventually disappear, and at the moment that the seedlings are firmly fixed to the substrate rope. The skilled person will appreciate that ribbon substrates can also be seeded with the direct seeding process, by adjusting the seeding parameters.

5           The skilled person will also appreciate that the seaweed seeding device can be used onshore and offshore. When it is used offshore, the invention can be used in a vehicle or vessel. Said vehicle or vessel can include a seaweed harvesting system, directly connected to a seaweed cultivation system and a coupling device for coupling substrate of seaweed, wherein the seaweed seeding device of this invention is also provided. Moreover, when the  
10       seaweed seeding device is used onshore, it can be stand alone or being carried on a vehicle, vessel or the seaweed cultivation system and any of these can be located at a position up to 0-100 meters from the sea line.

          While the invention has been described to not require driving means, in some embodiments, electric driving means could be present. More or fewer gear sets 18 and/or  
15       different transmission 16 means could be used depending on system requirements. Additionally, the shape, configuration and location of bobbin 26 and/or seaweed exit guide 24 can vary in different embodiments.

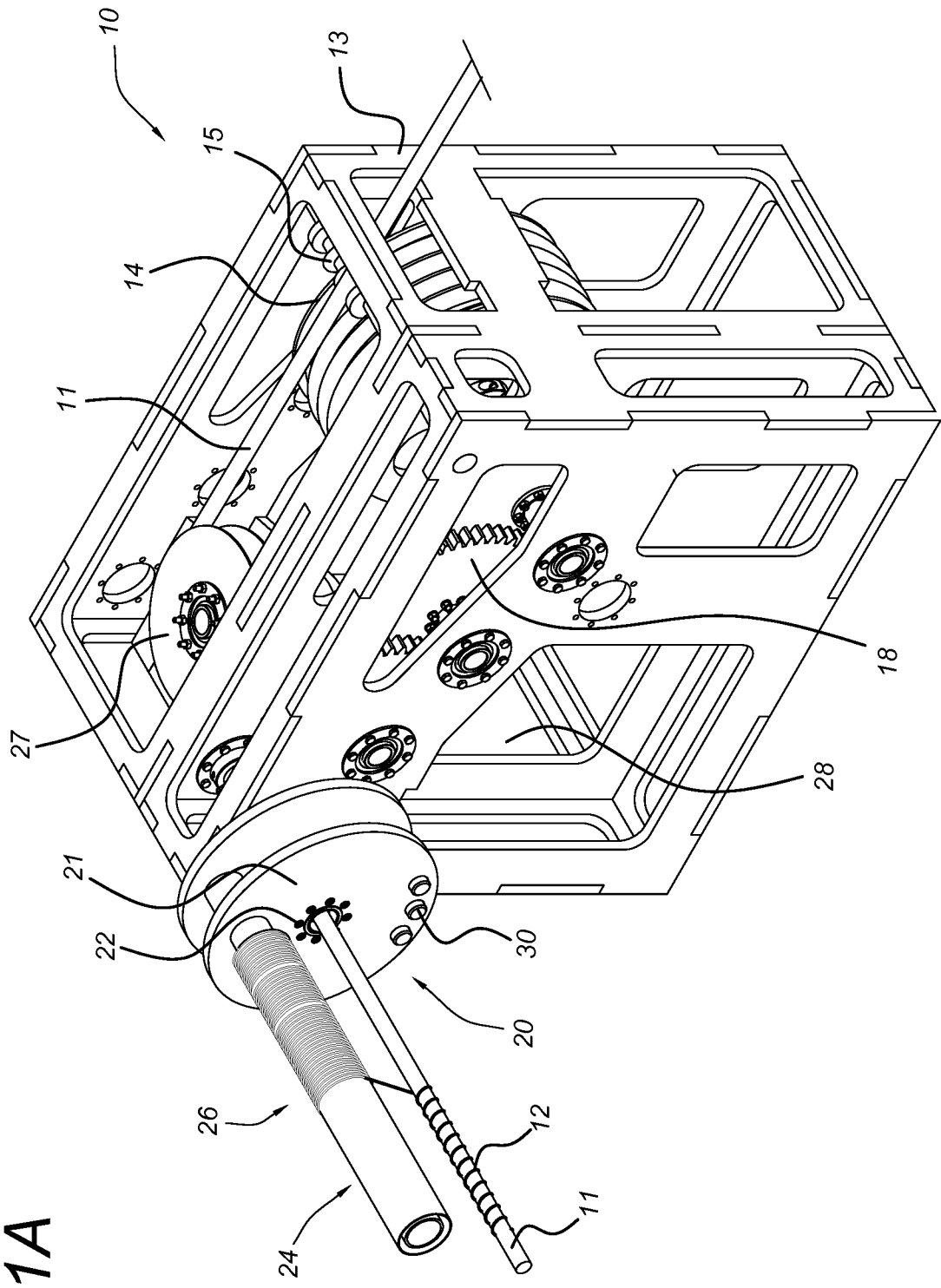
          While the invention has been described with reference to exemplary embodiments, it will be understood by those skilled in the art that various changes may be made and  
20       equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular or preferred embodiments disclosed, but that the invention will include all embodiments  
25       falling within the scope of the appended claims.

## Conclusies

1. Een zeewier zaaiinrichting voor het wikkelen van zeewier rond een hoofdtouw, de inrichting omvattend:
  - 5       - een draagconstructie;
  - een wrijvingswiel dat draaibaar verbonden is met de draagconstructie om het hoofdtouw te ontvangen rond het wiel en welke draait als het hoofdtouw door het apparaat wordt getrokken;
  - een spoeldrager die draaibaar verbonden is met de draagconstructie rond een rotatie-as;
  - 10       - een uitgangsgeleider voor zeewier aangesloten op de spoeldrager, op afstand van de rotatie-as; en
  - een overbrenging die het wrijvingswiel aansluit op de spoeldrager om de draaiende beweging van het wrijvingswiel over te brengen om de spoeldrager te roteren.
- 15    2. Inrichting volgens conclusie 1, verder omvattend een spoel verbonden aan de spoeldrager.
3. Inrichting volgens een der voorgaande conclusies, waarbij de overbrenging een tandwielstelsel omvat.
- 20    4. Inrichting volgens een der voorgaande conclusies, waarbij de spoeldrager een voorvlak omvat, en de uitgangsgeleider voor zeewier zich uitstrekt vanaf het voorvlak van de spoeldrager.
5. Inrichting volgens een der voorgaande conclusies, waarbij de overbrenging een aantal sets tandwielen omvat om de rotatiesnelheid van het wrijvingswiel naar de spoeldrager te verhogen.
- 25    6. Inrichting volgens een der voorgaande conclusies, en verder omvattend een geleidingswiel voor het geleiden van het hoofdtouw tussen het wrijvingswiel en de spoeldrager.
7. Inrichting volgens een der voorgaande conclusies, waarbij de draagconstructie een aantal sleuven omvat om verschillende voedingshoogten van het hoofdtouw in de draagconstructie op te nemen.
- 30    8. Inrichting volgens een der voorgaande conclusies, waarbij de spoeldrager verder een tegengewicht omvat.
- 35    9. Inrichting volgens een der voorgaande conclusies, waarbij de inrichting is gevormd uit Nylon.
10. Inrichting volgens een der voorgaande conclusies, waarbij het wrijvingswiel een hoge wrijvingsoppervlakkbedekking omvat.

11. Inrichting volgens een der voorgaande conclusies, waarbij het wrijvingswiel één of meerdere touwgeleiders omvat.
- 5 12. Inrichting volgens een der voorgaande conclusies, waarbij de spoel een uitgangsgeleider voor zeewier omvat die zich in een richting parallel met de rotatie-as uitstrekt.
- 10 13. Inrichting volgens één der voorgaande conclusies, waarbij de spoeldrager een holle as door de rotatie-as omvat om het hoofdtouw te ontvangen na het wikkelen rond het wrijvingswiel, waarbij de holle as optreedt als een uitgang voor het hoofdtouw van de inrichting.
14. Een vaartuig of onderwatervoertuig omvattend de inrichting volgens een der voorgaande conclusies.
- 15 15. Een werkwijze voor het wikkelen van zeewier rond een hoofdtouw, de werkwijze omvattend:
- het invoeren van een hoofdtouw in een zeewierwikkelinrichting een aantal keren rond een wrijvingswiel en uit een holle as van een spoeldrager;
  - het koppelen van een zeewiertouw van een spoel op de spoelhouder aan het hoofdtouw dat uit de holle as komt; en
  - het trekken van het hoofdtouw door de inrichting, waarbij de spoeldrager aan het wrijvingswiel is gekoppeld zodat een rotatie van het wrijvingswiel de spoeldrager draait, 20 waardoor het zeewiertouw dat uit de spoel komt rond het hoofdtouw wordt gewikkeld.

Fig. 1A



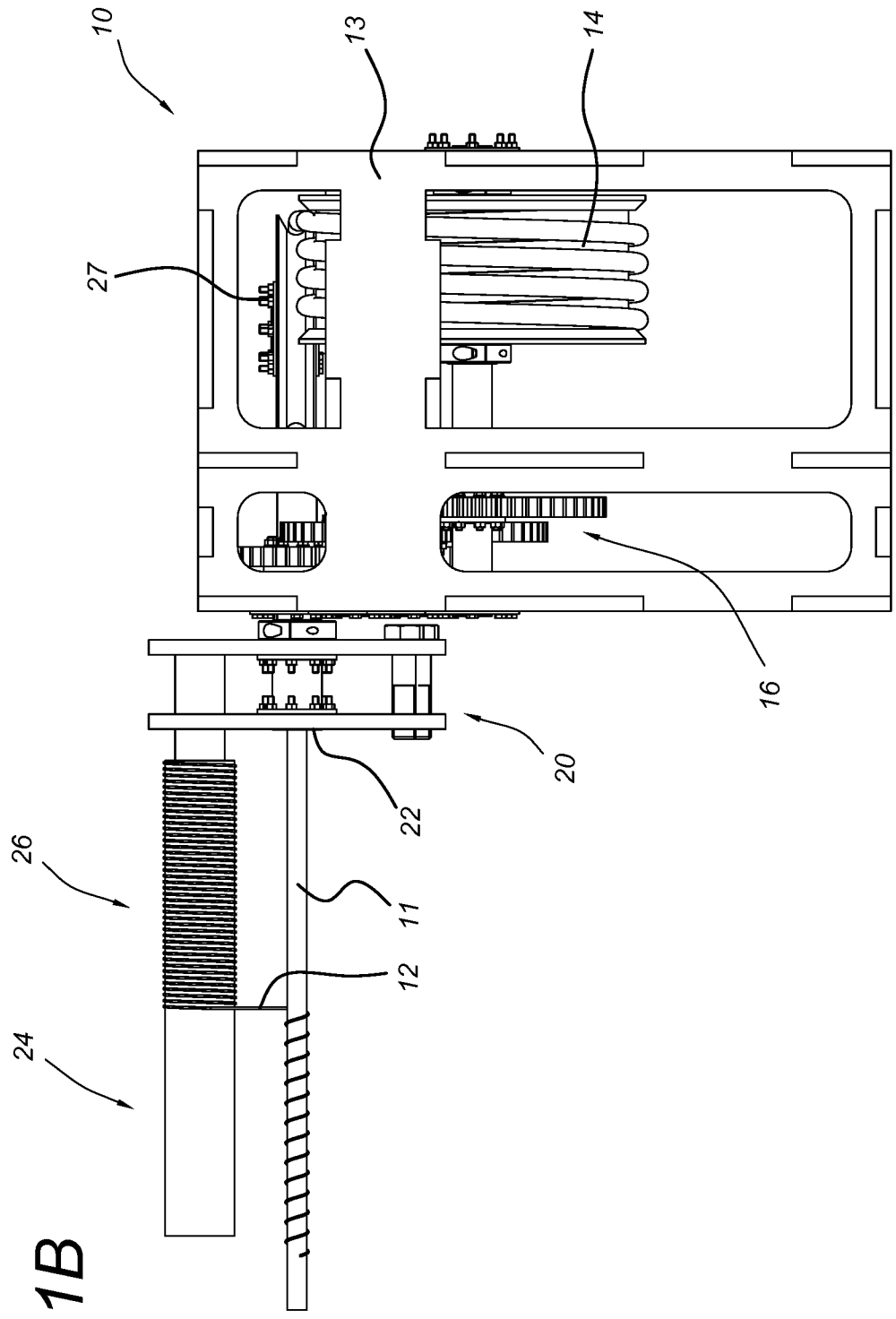


Fig. 1B

Fig. 1C

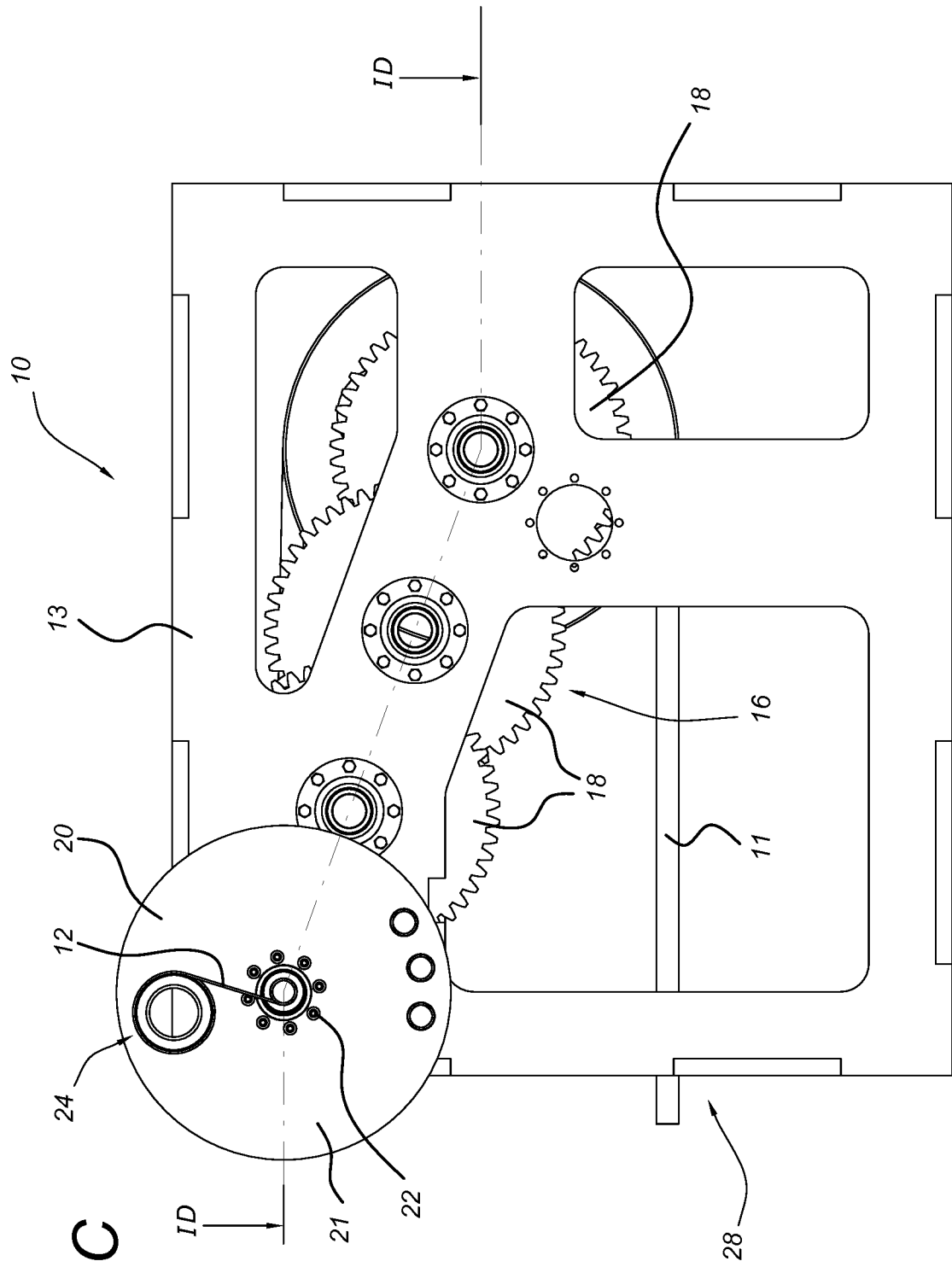
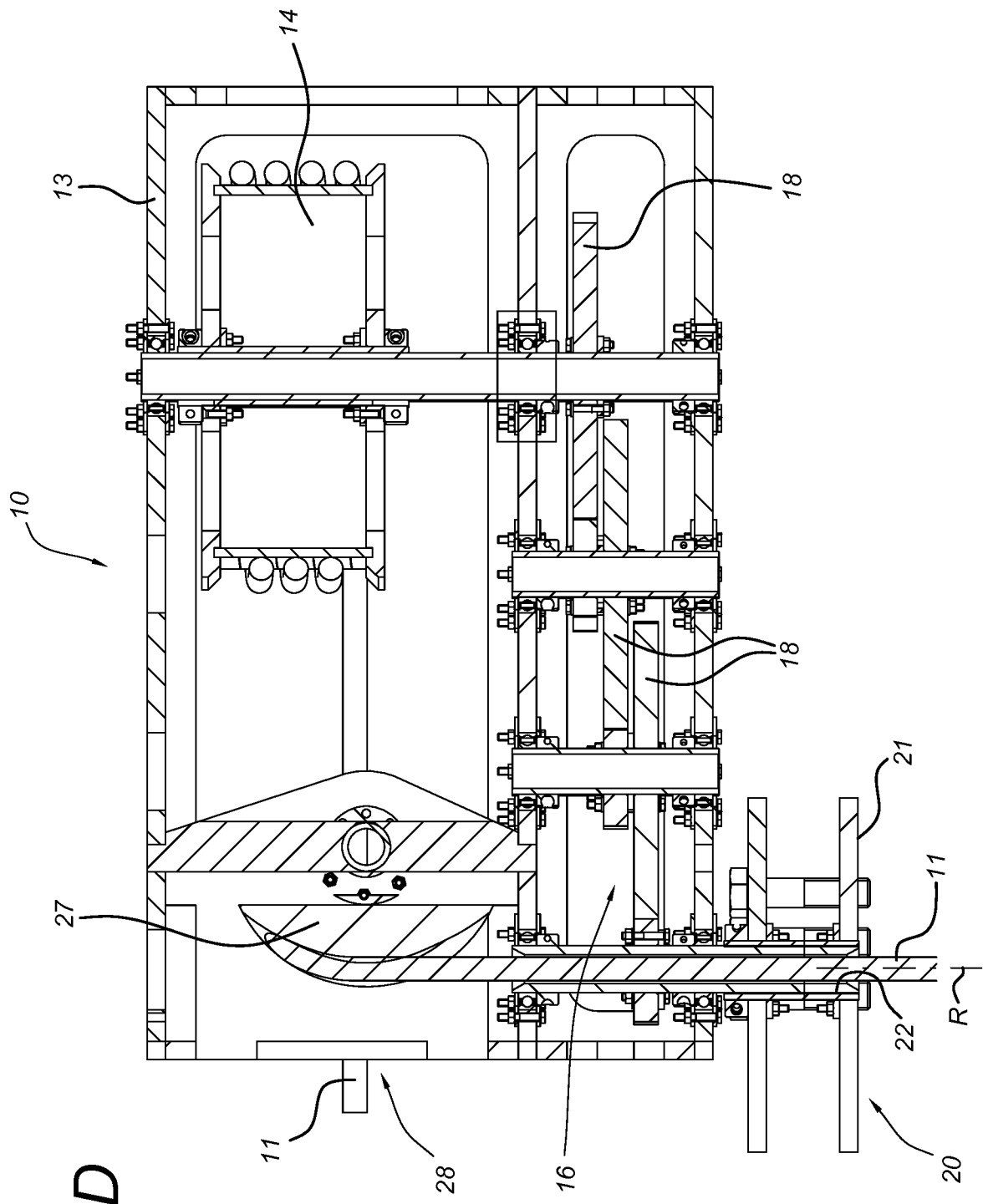


Fig. 1D



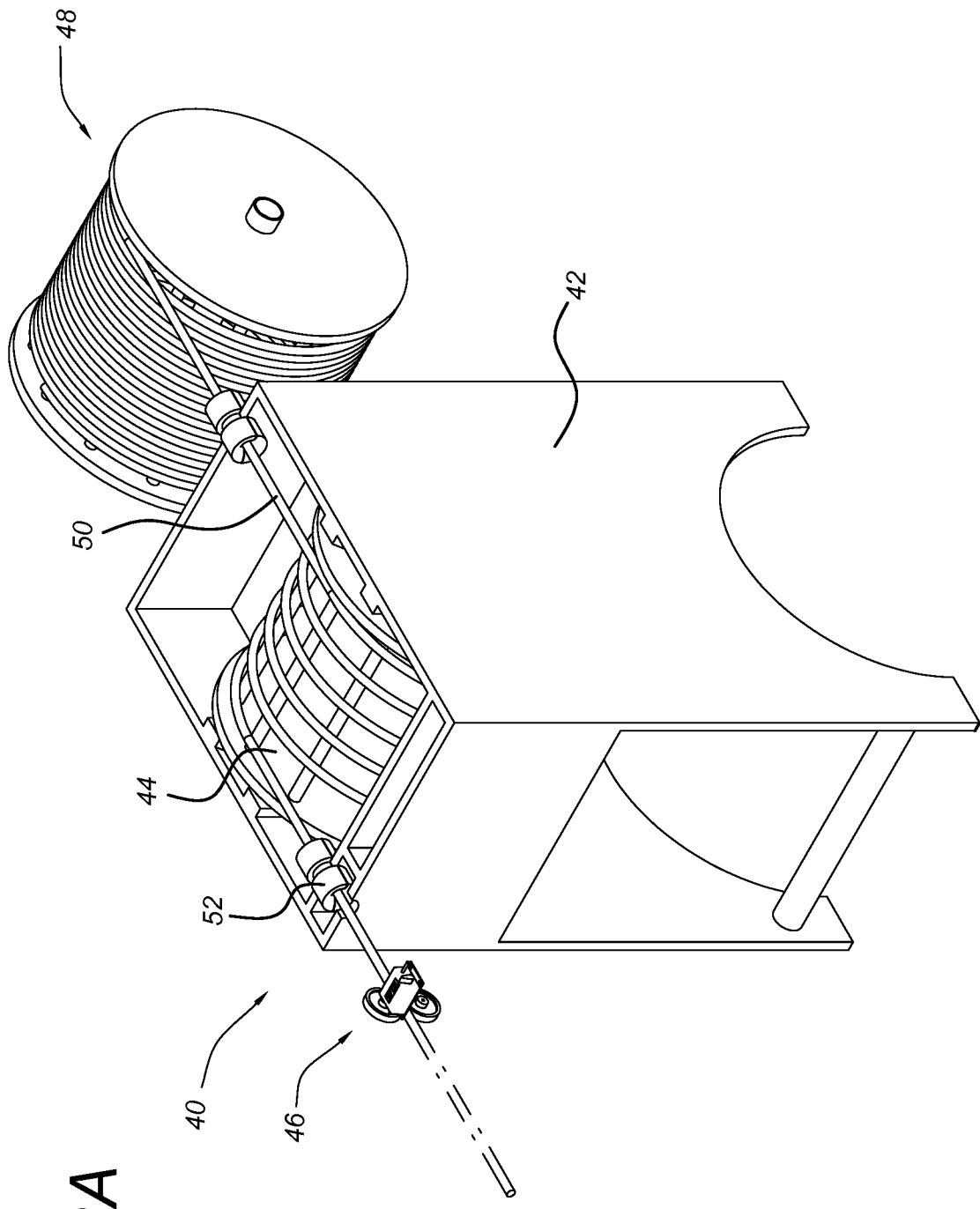
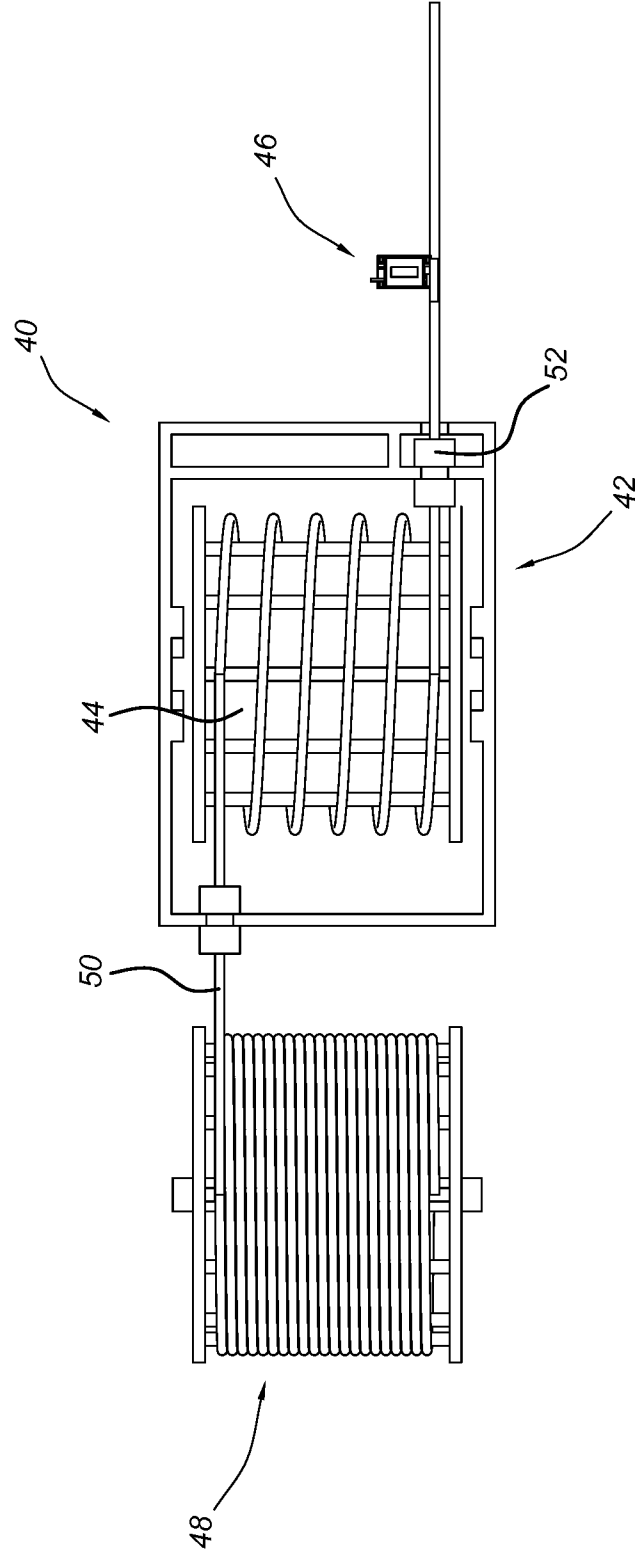


Fig. 2A

Fig. 2B



**Abstract**

A seaweed seeding device for wrapping seaweed rope around a main rope comprises a frame; a friction wheel rotatably connected to the frame to receive the main rope around the wheel and rotate as the main rope is pulled through the device; a bobbin carrier rotatably connected to the frame around an axis of rotation; a seaweed exit guide connected to the bobbin carrier offset from the axis of rotation; and a transmission connecting the friction wheel to the bobbin carrier to translate rotational movement of the friction wheel to rotate the bobbin carrier.

## SAMENWERKINGSVERDRAG (PCT)

### RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

|                                                                                                                                                                                                          |                                                                                                                                                |                                                         |                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------|
| IDENTIFICATIE VAN DE NATIONALE AANVRAGE                                                                                                                                                                  | KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE<br><br><b>P6064097NL1</b>                                                                       |                                                         |                                  |
| Nederlands aanvraag nr.<br><br><b>2019708</b>                                                                                                                                                            | Indieningsdatum<br><br><b>12-10-2017</b>                                                                                                       |                                                         |                                  |
|                                                                                                                                                                                                          | Ingeroepen voorrangsdatum<br><br><b>12-10-2016</b>                                                                                             |                                                         |                                  |
| Aanvrager (Naam)<br><br><b>IHC Holland IE B.V.</b>                                                                                                                                                       |                                                                                                                                                |                                                         |                                  |
| Datum van het verzoek voor een onderzoek van internationaal type<br><br><b>16-12-2017</b>                                                                                                                | Door de instantie voor internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.<br><br><b>SN70256</b> |                                                         |                                  |
| <b>I. CLASSIFICATIE VAN HET ONDERWERP</b> (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)<br>Volgens de internationale classificatie (IPC)<br><br><b>A01G33/00</b> |                                                                                                                                                |                                                         |                                  |
| <b>II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK</b>                                                                                                                                                           |                                                                                                                                                |                                                         |                                  |
| Onderzochte minimumdocumentatie                                                                                                                                                                          |                                                                                                                                                |                                                         |                                  |
| Classificatiesysteem                                                                                                                                                                                     | Classificatiesymbolen                                                                                                                          |                                                         |                                  |
| <b>IPC</b>                                                                                                                                                                                               | <b>A01G</b>                                                                                                                                    |                                                         |                                  |
| Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen<br><br>                                                          |                                                                                                                                                |                                                         |                                  |
| III.                                                                                                                                                                                                     | <input type="checkbox"/>                                                                                                                       | <b>GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES</b> | (opmerkingen op aanvullingsblad) |
| IV.                                                                                                                                                                                                      | <input type="checkbox"/>                                                                                                                       | <b>GEBREK AAN EENHEID VAN UITVINDING</b>                | (opmerkingen op aanvullingsblad) |

**ONDERZOEKSRAPPORT BETREFFENDE HET  
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar  
de stand van de techniek

NL 2019708

**A. CLASSIFICATIE VAN HET ONDERWERP**

INV. A01G33/00

ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

**B. ONDERZOCHETE GEBIEDEN VAN DE TECHNIEK**

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)

A01G

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)

EPO-Internal, BIOSIS, EMBASE, WPI Data

**C. VAN BELANG GEACHTE DOCUMENTEN**

| Categorie * | Geïsoleerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages                                                                        | Van belang voor<br>conclusie nr. |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| X           | KR 100 916 862 B1 (YU YONG SUK [KR])<br>9 september 2009 (2009-09-09)<br>* Figures 1, 2, 4; Abstract (Translation<br>(EPODOC) provided embedded in WOSN text) * | 1-15                             |
| X           | KR 2011 0092851 A (CHOI KYOUNG DONG [KR])<br>18 augustus 2011 (2011-08-18)<br>* Figure 1; Abstract (Translation (EPODOC)<br>provided embedded in WOSN text) *   | 1-15                             |
| A           | JP 2011 103853 A (AKITA PREFECTURE)<br>2 juni 2011 (2011-06-02)<br>* Figures 1, 4; Abstract (Translation<br>(EPODOC) provided embedded in WOSN text) *          | 1-15                             |
|             | -----<br>-/-                                                                                                                                                    |                                  |



Verdere documenten worden vermeld in het vervolg van vak C.



Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

\* Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvraag vermeld

"E" eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geïsoleerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"Z" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid

29 januari 2018

Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type

Naam en adres van de instantie

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De bevoegde ambtenaar

Roscoe, Richard

**ONDERZOEKSRAPPORT BETREFFENDE HET  
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar  
de stand van de techniek

NL 2019708

**C. (Vervolg). VAN BELANG GEACHTE DOCUMENTEN**

| Categorie * | Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages                                                                                                     | Van belang voor<br>conclusie nr. |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| A,D         | KR 2013 0053643 A (CHO SONG NAM [KR])<br>24 mei 2013 (2013-05-24)<br>in de aanvraag genoemd<br>* Figures 1, 4; Abstract (Translation<br>(EPODOC) provided embedded in WOSN text) *<br>----- | 1-15                             |
| A           | KR 101 295 409 B1 (HAN WOO SUK [KR])<br>9 augustus 2013 (2013-08-09)<br>* Figures 1, 7; Abstract (Translation<br>(EPODOC) provided embedded in WOSN text) *<br>-----                        | 1-15                             |

**ONDERZOEKSRAPPORT BETREFFENDE HET  
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar  
de stand van de techniek

NL 2019708

| In het rapport<br>genoemd octrooigescrift | Datum van<br>publicatie | Overeenkomend(e)<br>geschrift(en) | Datum van<br>publicatie                                |
|-------------------------------------------|-------------------------|-----------------------------------|--------------------------------------------------------|
| KR 100916862                              | B1                      | 09-09-2009                        | GEEN                                                   |
| KR 20110092851                            | A                       | 18-08-2011                        | GEEN                                                   |
| JP 2011103853                             | A                       | 02-06-2011                        | JP 5370095 B2 18-12-2013<br>JP 2011103853 A 02-06-2011 |
| KR 20130053643                            | A                       | 24-05-2013                        | GEEN                                                   |
| KR 101295409                              | B1                      | 09-08-2013                        | GEEN                                                   |

## WRITTEN OPINION

|                                                                    |                                                   |                                                     |                                     |
|--------------------------------------------------------------------|---------------------------------------------------|-----------------------------------------------------|-------------------------------------|
| File No.<br><b>SN70256</b>                                         | Filing date (day/month/year)<br><b>12.10.2017</b> | Priority date (day/month/year)<br><b>12.10.2016</b> | Application No.<br><b>NL2019708</b> |
| International Patent Classification (IPC)<br><b>INV. A01G33/00</b> |                                                   |                                                     |                                     |
| Applicant<br><b>IHC Holland IE B.V.</b>                            |                                                   |                                                     |                                     |

This opinion contains indications relating to the following items:

- ☒ Box No. I      Basis of the opinion
- ☐ Box No. II      Priority
- ☐ Box No. III      Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV      Lack of unity of invention
- ☒ Box No. V      Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI      Certain documents cited
- ☐ Box No. VII      Certain defects in the application
- ☒ Box No. VIII      Certain observations on the application

|  |                                    |
|--|------------------------------------|
|  | Examiner<br><b>Roscoe, Richard</b> |
|--|------------------------------------|

## WRITTEN OPINION

Application number

NL2019708

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### Box No. I Basis of this opinion

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1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material:
    - ☐ on paper
    - ☐ in electronic form
  - c. time of filing/furnishing:
    - ☐ contained in the application as filed.
    - ☐ filed together with the application in electronic form.
    - ☐ furnished subsequently for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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### Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

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#### 1. Statement

|                          |             |      |
|--------------------------|-------------|------|
| Novelty                  | Yes: Claims | 1-15 |
|                          | No: Claims  |      |
| Inventive step           | Yes: Claims |      |
|                          | No: Claims  | 1-15 |
| Industrial applicability | Yes: Claims | 1-15 |
|                          | No: Claims  |      |

#### 2. Citations and explanations

**see separate sheet**

## WRITTEN OPINION

Application number

NL2019708

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**Box No. VIII** Certain observations on the application

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see separate sheet

**1 Re Item V**

Reasoned statement on Novelty, Inventive Step and Industrial Applicability -

The documents mentioned in the present written opinion are numbered as in the search report, i.e. D1 corresponds to the first document of the search report etc.

- 1.1 It is noted that the prior art in this field is largely in Korean or Japanese as seaweed farming is historically established in these countries. In view of the limitations of automated translations, analysis is somewhat hampered. The Authorized Authority interpreted the prior art based on its initial interpretation of the machine translations. A full translation of certain documents may need to be obtained at a later stage if the exact wording becomes critical.

The EPODOC abstracts of the cited documents are provided below. These are best viewed in combination with the figures to interpret the mechanisms used.

D1:

An apparatus for winding a seedling line of seaweeds is provided to improve workability while preventing safety accidents. An apparatus for winding a seedling line of seaweeds comprises the following units. A winding unit(30) winds the seedling line on a rope passing through the external surface of a tube body(20). A height-adjusting unit(16) is installed at the bottom of a supporting frame(10). A speed controller(40) controls the rotation speed of a drive motor(14) so as to control the winding speed of the seedling line. The speed controller includes a foot switch(42) to operate the drive motor. A pair of bearings are installed between a housing and the tube body. A retainer is installed to prevent the bearing from being corroded caused by the salt adhering to the rope. An interval formed by the retainer is filled with oil. The housing has an oil cap.

D2:

A seaweed seedling line winding device is provided to prevent the generation of the vibration by the eccentric revolution of a bobbin through winding seaweed seedling lines to a culturing rope without rotating the bobbin.

CONSTITUTION: A seaweed seedling line winding device comprises the following steps: a base(10) including a rope mounting stand(11), a bobbin connecting unit(12), and a rope guide(13); and a bobbin fixing handle(121) formed on the bobbin connecting unit for fixing a bobbin(20). The rope mounting stand is formed on the rear lower side of the base to mount a fish culturing rope(2) passing through a rope pass hole with the bobbin from the

rear side of the bobbin. The rope guide supports the fish culturing rope from the front side of the bobbin. The bobbin is for winding a seaweed seedling line(1).

D3

**PROBLEM:** To provide a seaweed seeding yarn winder saving labor for seeding yarn winding work and efficiently utilizing a seeding yarn in culture of seaweed such as kelp or brown seaweed, and to provide a method for using the winder.

**SOLUTION:** The seaweed seeding yarn winder 1 is formed by winding a seaweed culture yarn 4 around a hollow cylinder or a polygonal cylinder, and is used as follows: using the seaweed seeding yarn winder 1 where seaweed seeds adhere to the yarn 4 wound around the seaweed seeding yarn winder 1 to culture the seaweed seeds for a prescribed period of time; passing a main line 10 into the cylinder of the seaweed seeding yarn winder 1; tying one end of the seeding yarn 4 with the main line 10; and sliding the main line 10 or the seaweed seeding yarn winder 1, so that the seeding yarn 4 is spontaneously and helically wound around the main line 10.

D4

**PURPOSE:** A seaweed fusiforme spore winding apparatus is provided to be able to easily bind a seedling line in which spores of seaweed fusiforme are attached and sprouted with a binding string, and to uniformly maintain the binding force of the binding string. **CONSTITUTION:** A main pipe(120) has a hollow hole so that a seedling line and a culture rope are penetrated, and is extended to a predetermined length. A rotary unit(130) comprises a driven pulley(134), a driving pulley(132), and a driving motor(131). A binding unit comprises a binding string winding roll(141), and a binding string rotating unit fastening the culture rope and the seedling line through a binding string. A guide unit(160) guides the seedling line and the culture rope respectively, and maintains the tension. The guide unit comprises a first guide part(161) guiding the culture rope, and a second guide part(171) guiding the seedling line in which seaweed fusiforme spores are sprouted.

D5

**PURPOSE:** A seaweed spore string fastening apparatus is provided to automatically insert and cut a seaweed spore string to fix the seaweed spore string at constant intervals on the rope. **CONSTITUTION:** A rope supplying unit supplies a rope (R) for fastening a spore string to the predetermined length, and twists the rope to widen rope strands. A spore string fastening unit

(200) inserts the seaweed spore string to the rope, and cuts the spore string which is fastened to the rope. A rope tube (110) is for passing the rope. A gripper (120) grips the tip-end of the rope exiting the rope tube. A guide rail (130) moves the gripper forwards and backwards. A pneumatic actuator (140) reciprocates the gripper along the guide rail. A pinion gear (182) is installed on the outside of the rope tube with a chuck (170).

## **1.2 Novelty**

None of the above documents use a friction wheel to couple movement of the incoming "main rope" with application of the "seaweed rope". Further, in D1-D4, where a similar form of wrapping is applied, the spindle/bobbin is not offset from the axis of rotation. In D5 the rope is twisted open to insert short segments of seaweed rope. D5 serves to show that entirely different means of attachment also exist.

## **1.3 Inventive Step**

The prior art uses a number of different means for attaching seed rope to a main rope. D1-D2 wind the former round the latter, as does D3 (albeit without active winding). D4 ties the two ropes together by spinning a further tying rope around the aforementioned ropes, whilst D5 unwinds the strands of a rope and inserts short pieces of seed rope before tightening the strands again.

In view of D1-D2, either of which can be used as the closest prior art, applicant is considered to be providing a simplified means of attaching a seaweed seed rope to a main supporting rope.

D1 and D2 are considered the best starting points since the both use a spindle which turns around the main rope to apply the seed rope to the main rope. Here, the main rope passes through the core of the spindle (bobbin). The spindle movement is achieved by an electrical motor, the speed of which can be regulated (for example by a foot pedal)

In the description, applicant states that his device has the advantage compared to the art (he refers to D4) that the prior art requires motors which are more prone to failure and cannot survive harsh or underwater conditions (p.1, l.22-23). In contrast, applicant uses a transmission (overbrenging) to connect and translate rotational motion through the device (to couple motion of main rope and rotational speed of the bobbin).

The claims do however not strictly reflect the claimed advantage. There is no indication how the main rope is to be pulled through the apparatus and due to the use of the term comprising and additionally the fact that the device can be

a module in a system with further parts, other parts may be used in the working setup. Most likely, the apparatus would simply form a module with a connected further module pulling the rope through. Such a module would need to have an electric motor. Thus the susceptibility would merely be in another part of the complete apparatus. This would not appear to solve any problem.

Further, the use of gears to couple movement of the main rope and the rope to be wound around it is simply a mechanical means of coupling the movement. This is a simple alternative to the electronic types of coupling conventionally used in modern machinery. It is quite clear that some control of winding in relation to main rope movement is advantageous to achieve consistency in the density of seaweed attached to the main rope. D1 apparently relies on the operator to adjust speed according to how fast the rope main rope is pulled through (para. [0026-0028]). Automation of such a step is however trivial and part of the general knowledge of a skilled person.

Hence, applicants general concept can not be considered inventive. The use of counterweights is obvious to reduce vibration. The problem of vibration in general is already identified in D1 and D2. Nylon cogs can of course be used in a moist environment. Nylon or other polymers are often used in cogs in e.g. washing machines. The bobbin mounting in Fig. 1A of application and as set out in claims 1 in combination with 13 differs from the art in that the main rope does not pass through the core of the bobbin. Applicant has however not identified any technical effect of this configuration which could be taken into account in assessing inventive activity.

A vessel comprising the device is also obvious since in D2 the drag of parts of the rope already in the water pulls the rope through as the ship carrying it moves, i.e. it must be mounted on this ship).

Hence, at present, inventive step is not acknowledged for any of the claims.

**1.4 Industrial Applicability**

Present claims appear to be industrially applicable.

**2 Re Item VIII**

**2.1 Clarity**

- 2.1.1 For the purpose of assessment, only devices which are actually used for seaweed seeding have been assessed. For a product claim such as claim 1 it is however to be noted that any device suitable for wrapping seaweed rope around a main rope would anticipate the claim. There are of course a myriad

of mechanical devices for wrapping one strand of cable/string/rope around another core cable/string/rope. Such devices include those used in the 19th century for wrapping paper or cotton insulation around electricity cables. It is questionable which of these and other devices used for similar purpose would be "suitable" for wrapping seaweed. A final assessment would need to be made in a regional phase. It is however noted, that to clearly distinguish the device from similar/identical devices used in other fields, it would seem that a limitation to a seeding device where the Bobbin is actually loaded with seaweed could be pertinent. Alternatively, limitation to a method of using said device for seeding seaweed.

- 2.1.2 The term "friction wheel" (wrijvingswiel) as used in present application does not appear to be a common use of the term. Friction transmission systems are commonly used in mopeds (or the old DAF car). Applicant may thus need to clarify what he means by the term in the claim.
- 2.1.3 The term "offset from the axis of rotation" (op afstand van de rotatie-as) defines where the bobbin can not be but fails to define where it actually is. From Fig.1A one can see what is intended, yet this is not clear from the claim.