

1 "Apparatus and a Method for Use in Handling a Load"

2

3 This invention relates to apparatus for use in handling
4 a load which is capable of raising and lowering, or of
5 towing, a load and also handling service cables and/or
6 hoses connected to the load. The invention is
7 particularly, but not exclusively, applicable to the
8 handling of subsea equipment such as grabs.

9

10 Hitherto, providing services to underwater equipment
11 has required the provision of a specific bundle of
12 cable(s) and/or hose(s) dedicated to each application.
13 For some applications, it is known to incorporate the
14 service bundle within an armoured hoist rope. This
15 approach has a number of deficiencies. The resulting
16 rope is costly, gives inferior hoisting properties, and
17 by virtue of limitations on the diameter of rope which
18 can be handled the services which can be incorporated
19 are limited. Further, in practice it is impossible
20 with this arrangement to add to the length of the rope
21 or to join different types of materials, for example
22 wire ropes with fibre ropes.

23

24 In accordance with an aspect of the present invention,
25 apparatus for use in handling a load comprises a load-

1 bearing rope, a mechanism for paying out and recovering
2 the rope, a drum for holding a service cable with a
3 length of the service cable extending therefrom, and a
4 wrapping device for rotating said length of service
5 cable around the rope as the rope is payed out to wrap
6 the service cable around the rope, and to unwrap the
7 service cable from the rope as the rope is recovered.

8
9 In accordance with another aspect of the present
10 invention, a method of handling a load comprises paying
11 out a load-bearing rope and wrapping a service cable
12 around the rope as it is payed out, and subsequently
13 unwrapping the service cable from the rope as the rope
14 is recovered.

15
16 The term "service cable" is used herein to denote a
17 flexible elongate member used for conveying power or
18 data, such as an electrical cable, a fibre optic cable,
19 or a pneumatic or hydraulic hose.

20
21 Preferably, the service cable is wrapped helically
22 around the rope.

23
24 Typically, the load-bearing rope will be a hoist rope
25 used for raising and lowering a load. Alternatively,
26 the load-bearing rope may be a towing rope used for
27 paying out, towing and recovering a load such as a
28 marine sensor array.

29
30 The apparatus may include a plurality of service cables
31 each extending from a respective drum.

32
33 Preferably, the mechanism for paying out and recovering
34 the rope comprises a rope winch, from which the rope
35 passes over a rope sheave and thereafter extends to the
36 load along a substantially straight axis.

1 The wrapping device may comprise the or each service
2 cable drum being arranged for rotation about a drum
3 axis which coincides with said axis, the drum typically
4 having a central aperture through which the load-
5 bearing rope passes, said length of service cable
6 preferably passing over a service cable sheave which is
7 mounted for movement in a circular path around said
8 axis.

9
10 Alternatively, the or each service cable drum may be
11 rotatable on a structural member which is arranged for
12 movement in a circular path about said axis.

13
14 The hoist rope winch, the or each service cable drum,
15 and the wrapping device may conveniently each have a
16 respective driving motor; they could however be driven
17 by a single source through appropriate mechanical
18 linkages.

19
20 Examples of apparatus and a method for use in handling
21 a load in accordance with the invention will now be
22 described with reference to the drawings, in which:-

23
24 Fig. 1 is a schematic perspective view
25 illustrating the principle of operation of a first
26 example of the invention;

27 Fig. 2 is a more detailed side view, partly in
28 section, of an apparatus used in the example of
29 Fig. 1;

30 Fig. 3 is a view similar to Fig. 1 illustrating a
31 modification of the arrangement of Fig. 1;

32 Fig. 4 is a schematic perspective view
33 illustrating a second example of the invention;

34 Fig. 5 is a side view of an apparatus used in the
35 example of Fig. 4;

36 Fig. 6 is a schematic perspective view

1 illustrating a third example similar to that of
2 Fig. 1 but modified for towing rather than
3 lifting; and
4 Fig. 7 illustrates a fourth example similar to
5 that of Fig. 4 but modified for towing rather than
6 lifting.

7
8 Referring to Fig. 1, a hoist rope 1 extends from a
9 hoist rope winch 13 over a hoist rope sheave 4 to
10 support a load (not shown) for raising and lowering.
11 The hoist rope 1 may be any suitable form of hoist rope
12 such as flexible steel wire rope or synthetic fibre
13 rope, for example of "Kevlar". A service cable 2 is
14 reeled on a service cable drum 3 and extends to the
15 load via a service cable sheave 5.

16
17 The hoist rope 1 passes through a central aperture of
18 the service cable drum 3, and the service cable sheave
19 5 is arranged to be driven circumferentially around the
20 axis of the service cable 1. By coordinating the
21 movements of the hoist rope winch 13, the service cable
22 drum 3 and the service cable sheave 5, the service
23 cable 2 can be wrapped helically around the hoist rope
24 1 as the load is lowered, and unwrapped as the load is
25 raised. In this way, a hoist rope of any desired
26 properties can be used in combination with any required
27 service connection.

28
29 Fig. 2 shows the service cable drum 3 and associated
30 parts in greater detail. The hoist rope sheave 4 is
31 journaled to a fixed frame 20 which is secured to any
32 suitable supporting structure (not shown). The service
33 cable drum 3 is rotatably mounted on the lower part of
34 the frame 20 and driven in rotation by a motor 6.

35
36 The inner end of the service cable 2 is connected to

1 the appropriate service by a coupling assembly 8 which
2 comprises a slipping arrangement in the case of
3 electrical or fibre optic services or a rotary coupling
4 in the case of pneumatic or hydraulic services; such
5 rotary couplings are well known per se.

6
7 The service cable sheave 5 is journalled on a mounting
8 frame 9 which is rotatable about the fixed frame 20 by
9 means of a motor 7.

10
11 The service cable 2 shown in this embodiment may be a
12 single cable or hose, or may be a specially made cable
13 comprising a plurality of cable(s)/hose(s).

14
15 The motors 6 and 7 are driven at speeds related to the
16 axial speed of the hoist rope 1. The speed correlation
17 may be fixed. Preferably, however, this correlation
18 will be controllable to alter both the length of twist
19 (pitch) of the lay of the service cable 2 on the hoist
20 rope 1, and the tension in the service cable 2.

21
22 Fig. 3 shows a modification in which a second service
23 cable 17 is wrapped on the hoist rope 1 along with the
24 service cable 2. In this modification, the service
25 cables 2, 17 are each provided with a respective
26 storage drum 15, 16 and a respective sheave 5, 14 which
27 may suitably be carried on a common supporting frame
28 for rotation in unison.

29
30 The apparatus may be further modified by adding further
31 drums and sheaves to handle more services.

32
33 Fig. 4 illustrates a second example in which the
34 service cable 2 is reeled on a drum 3 and the drum 3 is
35 itself rotated about the hoist rope 1 to achieve a
36 helical wrap and unwrap. As shown in more detail in

1 Fig. 5, the service cable drum 3 may be constituted by
2 a drum 12 removably mounted on a hub motor 11 which is
3 carried on the end of an arm 18 rotatably mounted on
4 the fixed frame 20 and driven by a motor 10.

5
6 As with the first example, the example shown in Figs. 4
7 and 5 could be modified by adding further service cable
8 drums to be rotated by the motor 10.

9
10 Fig. 6 illustrates the example of Fig. 1 modified for
11 use in a marine towing application, for example in
12 paying out, towing and recovering a sensor array such
13 as a sonar sensor or seismographic surveying sensor,
14 the sensor array being towed underwater or on the
15 surface. The service cable drum 3 is hinged to the
16 main structure of the towing vessel (not shown) and can
17 be tilted to a desired towing angle by hydraulic or
18 other mechanisms. Likewise, Fig. 7 illustrates the
19 modification of the example of Fig. 4 for the same use,
20 the frame carrying the mounting arm for the service
21 cable drum 3 being hinged to the vessel and tilted to
22 the desired angle by hydraulic or other mechanisms.

23
24 The invention may be applied to a system in which one
25 or more service cables is applied to a load-bearing
26 rope which itself carries a service channel in addition
27 to fulfilling its load-bearing function. For example,
28 the load-bearing rope could be a steel wire rope
29 carrying electrical signals, or a rope comprising
30 "Kevlar" load-bearing strands in combination with
31 optical fibre cable.

32
33 Other modifications may be made within the scope of the
34 invention.



1 CLAIMS

- 2
- 3 1. Apparatus for use in handling a load, the
- 4 apparatus comprising a load-bearing rope (1,19), a
- 5 mechanism for paying out and recovering the rope
- 6 (1,19), a drum (3,12,15,16) for holding a service cable
- 7 (2,17) with a length of the service cable (2,17)
- 8 extending therefrom, and a wrapping device for rotating
- 9 said length of service cable (2,17) around the rope
- 10 (1,19) as the rope is payed out to wrap the service
- 11 cable (2,17) around the rope, and to unwrap the service
- 12 cable (2,17) from the rope (1,19) as the rope is
- 13 recovered.
- 14
- 15 2. Apparatus according to claim 1, wherein there are
- 16 a plurality of service cables (2,17) each extending
- 17 from a respective drum(3,12,15,16).
- 18
- 19 3. Apparatus according to claim 1 or claim 2, wherein
- 20 the means for paying out and recovering the rope (1,19)
- 21 comprises a rope winch (13), from which the rope (1,19)
- 22 passes over a rope sheave (14) and thereafter extends
- 23 to the load along a substantially straight axis.
- 24
- 25 4. Apparatus according to claim 3, wherein the
- 26 wrapping device comprises the or each service cable
- 27 drum (3,12,15,16) being arranged for rotation about a
- 28 drum axis which coincides with said axis.
- 29
- 30 5. Apparatus according to claim 4, wherein the or
- 31 each service cable drum (3,12,15,16) has a central
- 32 aperture through which the load-bearing rope (1,19)
- 33 passes.
- 34
- 35 6. Apparatus according to any of claims 3 to 5,
- 36 wherein the length of service cable (2,17) passes over



1 a service cable sheave (5,14) which is mounted for
2 movement in a circular path around said axis.

3
4 7. Apparatus according to claim 3, wherein the or
5 each service cable drum (3,12,15,16) is rotatable on a
6 structural member (20) which is arranged for movement
7 in a circular path about said axis.

8
9 8. Apparatus according to any of claims 3 to 7,
10 wherein the rope winch (13), the or each service cable
11 drum (3,12,15,16) and the wrapping device each have a
12 respective driving motor (6,7,10).

13
14 9. Apparatus according to any of claims 3 to 7,
15 wherein the rope winch (13), the or each service cable
16 drum (3,12,15,16) and the wrapping device are driven by
17 a single source through appropriate mechanical
18 linkages.

19
20 10. A method for use in handling a load, the method
21 comprising paying out a load-bearing rope and wrapping
22 a service cable around the rope as it is payed out, and
23 subsequently unwrapping the service cable from the rope
24 as the rope is recovered.

25
26 11. A method according to claim 10, wherein a
27 plurality of service cables are wrapped around the rope
28 as the rope is payed out.

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