SERVICE UNIT FOR COMBINED DRY BULK AND BULK OIL CARGO VESSELS

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INVENTORS
G.T.R. Campbell
N.V. Laskey

ATTORNEYS.
This invention relates to service units for use in combined dry bulk and bulk oil cargo vessels and particularly to improvements in the service unit disclosed in our co-pending U.S. Patent application Serial No. 278,622 filed May 7, 1963, now Patent No. 3,182,669.

In the service unit disclosed in the above-mentioned co-pending patent application, heating of the bulk oil carried in the tanks of the vessel was effected by supplying steam to the top of the service unit to fill the outer tubular sections of the unit and so transmit heat to the surrounding oil. By this means the whole vertical height of the service unit was heated at the expense of a considerable quantity of steam, considering the limited boiler capacity of oil carrying vessels. In addition, this system necessitated the withdrawal of a considerable quantity of condensate from the service unit, further adding to the expense of the heating service.

In the present invention, the general characteristics of the service unit remains the same except that instead of the steam being allowed to fill the whole interior of the unit, the steam is carried down an internal pipe to within a short distance of the bottom of the unit, the pipe is then passed through the wall of the unit to the exterior and is coiled upwards around the unit for a distance of approximately one third the height of the unit. The pipe is then straightened out to pass directly upwards to the head of the unit where it connects with a return pipe to the source of steam supply. The actual length of the heating coil will depend on the volume of oil to be heated and the temperature at which the coil is to be maintained.

The wash water fills the entire interior of the service unit thereby eliminating considerable internal piping and transverse division plates previously required. Thus, the head of the service unit is designed for mounting in the hatch cover of the vessel when oil is being carried in the holds of the vessel and, when not required for heating or washing purposes, such as when dry bulk cargo is being carried, can be stowed in the hollow corrugated bulkheads of the vessel.

The object of the invention is, therefore, to provide a more economical service unit which will be economical in the use of steam for heating and more efficient for washout the holds of the vessel after the carriage of oil cargo.

A further object of the invention is to provide a service unit which can be mounted in the hatch covers of the vessel when in use and can be stowed in the hollow bulkheads of the vessel when not in use.

A further object of the invention is to provide a service unit and a hatch cover whereby direct steam and water connections are made between them without the use of removable connections.

A further object of the invention is to provide a hatch cover having built-in compartments for steam and water and to which flexible connections can be made from the vessel’s steam and water mains.

These and other objects of the invention will be apparent from the following detailed specification and the accompanying drawings, in which:

Fig. 1 is a partial transverse vertical section of the deck and double bottom of a vessel showing the top end of the service unit mounted in the hatch cover and having its lower end mounted in a socket in the double bottom of the vessel.

Fig. 2 is a vertical elevation of the service unit stowed and secured in a hollow transverse bulkhead of the vessel.

Fig. 3 is a vertical section through one of the upper diffusion sections taken on the line 3–3 of Fig. 2.

Fig. 4 is a vertical section through one of the lower diffusion sections taken on the line 4–4 of Fig. 2.

Fig. 5 is an enlarged partial vertical section of the service unit showing the means for mounting it in the cargo hatch and the steam and water connections to compartments in the hatch cover.

Fig. 6 is a vertical section taken on the line 6–6 of Fig. 5.

Fig. 7 is a partial plan view of a cargo hatch showing a pair of service units mounted therein and also showing the piping connections to the hatch cover compartments and service units.

Referring to the drawings, the service unit 5 comprises a series of tubular sections 6, 7, 8, 9 and 10. A diffusion section joins the various tubular sections together to form the complete service unit 5. The upper diffusion sections 11 and 12 are interposed between the tubular sections 6, 7 and 8 and each have circular side walls 13 of larger diameter than that of the said tubular sections, and conical end walls 14 whose smaller diameter is the same as the diameter of those tubular sections.

See detail in Fig. 3.

The lower diffusion sections 15 and 16 are similar to the diffusion sections except that the upper end of the circular side walls 13 are joined to the adjacent end of the tubular sections by a flat wall 17 disposed at right angles to the axis of the tubular sections.

A series of nozzles 18 are arranged in the side walls 13 and end walls 14 of the diffusion sections 11, 12, 15 and 16. Each of the nozzles 18 are preferably adjusted to an angular setting after the service unit has been installed in a vessel in order to provide the best pattern for cleaning the adjacent surfaces of the hold of the vessel. Preferably, the upper diffusion sections 11 and 12 are provided with a greater number of nozzles 18 than the lower diffusion sections 15 and 16.

While the diffusion sections are shown as being circular in cross section, it will be understood that they could take any other convenient shape to suit any particular pattern of spray cleaning.

The lower end 19 of the service unit 5 is provided with a pintle 20 for locating the lower end of the unit either in its operating position in the hold of the vessel or in a stowage location as will be described later.

The upper end of the service unit 5 is provided with a service head 21 for connecting the unit with a source of water and steam and also to provide means whereby the service unit can be mounted in its operative or stowage position.

The service head 21 is welded about the upper end of the tubular section 6 and consists of a circular plate 22 having a downwardly projecting peripheral ring 23, and supported by the plate brackets 24. A cap plate 25 is welded to the top of the upper tubular section 6 and to the top of the brackets 24. This cap plate 25 is disposed at right angles to the axis of the unit 5 and forms a unit mounting flange. A dished form 26 is secured to the top surface of the mounting flange 25 and forms a steam inlet passage 27, extending from near the periphery of the flange to a position beyond the central axis of the unit 5. A similar but shorter dished form 28 is located diagonally in line with the dished form 26 to form a condensate outlet passage 29. A steam pipe 30 is axially located within the service unit 5 and has its upper open
end fixed in the central aperture 31 in the mounting flange 25 and in communication with the steam inlet passage 27.

The steam pipe 30 extends axially downwards to within a short distance of the lower end of the unit 5 where it is projected through the wall of the lower tubular section 10. From this point the pipe 30 is wound spirally upwards at a spaced distance from the outer wall surface of the section 10 to form the heating coil 31. The pipe 30 is straightened out at 32 to pass the lower diffusion section 16 and is then formed into the coil 33 about the tubular section 9. The pipe 30 is again straightened out at 34 to pass the diffusion section 15 and again forms the coil 35 about the tubular section 8. Thereafter, the pipe 30 is straightened out at 36 and is directed straight upwards and has its end 37 secured in the aperture 38 in the mounting flange 25 and in communication with the condensate outlet passage 29.

The upper end of the tubular section 6 of the unit 5 has a large water inlet 39 located above the level of the peripheral ring 23.

In the present application the service unit 5 is shown mounted in a hatch cover of a vessel and it is preferable that a unit 5 be mounted at each of the four corners of the hatch cover.

The hatch cover 40 is provided with one or more service housings 41 within which the service head 21 of the service unit 5 is seated. Preferably there is a service housing 41 located at all four corners of the hatch cover. The service housing 41 includes three separate compartments, a wash water compartment 42, a steam compartment 43 and a condensate return compartment 44. The centrally located wash water compartment 42 is formed by the cap plate 25 of the service head 21 and the vertical side walls 46, 47, 48 and 49 of the hatch cover 40. A lower wall 50 with the top wall 45 extends partially towards the vertical side walls 46, 47, 48 and 49 to form a supporting seat 51 for the annular sealing ring 52.

Wash water is supplied to the compartment 42 from a water main 53 located in the longitudinal ventilating ducts 54 located under the deck 55 on either side of the hatch openings 56. A branch connection 57 from the wash water main 53, including a remotely controlled valve 58, is directed upwards through the deck 55 and, through a flexible connection 59 makes connection with the T 60 and the pipes 61 leading to two wash water compartments 42. The wash water within the compartment 42 is sealed off from the hold of the vessel by the seal base 62, the seal ring 63 and the annular ring 64. Steam is directed into the compartment 43 from a steam main, preferably located in the ventilating duct 54 and through branch connection 64 and valve 65 to the T 66 and the pipes 67.

The compartment 44 is also formed under the top wall 45 of the hatch cover 40 and the outer surface of the vertical wall 46 of the compartment 42, and is in direct communication with the steam inlet passage 27 in the head structure 21 of the service unit 5 via the aperture 63. Steam is directed into the compartment 43 from a steam main, preferably located in the ventilating duct 54 and through branch connection 64 and valve 65 to the T 66 and the pipes 67.

When the service unit 5 is fitted into the hatch cover 40 the pindle 20 in the lower end of the unit is aligned up with and fitted into the socket 73 set in the floor 74 of the hold of the vessel. By this means the service unit is held firmly in a vertical position and is prevented from moving from this position with movement of the vessel.

When dry bulk cargo is being carried in the holds of the vessel, it is preferable that the service units 5 be removed as they would otherwise prove a hindrance to the handling of the dry cargo. Also, the presence of the service units in the holds would subject them to injury by the cargo handling equipment. A self-made storage compartment for the service units is available in the hollow transverse bulkheads which are now considered necessary in large bulk cargo vessels.

FIG. 2 of the drawings shows a service unit 5 installed in such a hollow bulkhead 75. In such an installation the service head 21 of the service unit rests on the deck 76 of the vessel in the area between adjacent ends of hatch covers. The pindle 20 on the lower end of the service unit 5 is fitted into the socket 77 fitted under the floor 74 of the hold and aligned centrally with the hollow bulkhead, as seen in FIG. 2.

A number of service units 5 can be stowed side by side in the hollow transverse bulkheads 75 in the area between hatch covers and, in this position, do not interfere with normal working around the deck.

Suitable cover plates, not shown, seal off the apertures in the hatch covers and on the deck of the vessel when the service unit is not fitted in one or other of these locations.

In the operation of this invention when bulk oil is being carried in the holds of the vessel, the service units are fitted in place in the hatch covers with their lower ends located in the socket 73 set in the floor of the holds. Steam, condensate and wash water connections are made to the compartments 42, 43 and 44 in the hatch covers from the mains. The appropriate valves are opened in the steam and condensate return connections to permit steam to pass into the steam pipe 30 and into the sections of heating coils 31, 33 and 35 about the lower end of the service units. As a result of the heat from the heating coils, convection currents are set up in the oil. With a service unit installed at all four corners of the hatch cover the convection currents set up will be effective over a large area of the hold. It has been found that with this arrangement of the service units it is only necessary that the heating coils 31, 33 and 35 be located at the lower portion of the service units in order to provide adequate heating of the bulk oil cargo. The condensate in the heating pipes and coils is drawn off through the pipe 36.

After the cargo oil has been discharged, the wash water valves 58 are opened to permit wash water to flow to the compartments 42 in the hatch cover and to pass through the large aperture 39 to flood the whole length of the service units 5. As this wash water is under pressure, it is projected outwards through the nozzles 18 in each of the diffusion sections 11, 12, 15 and 16 and on to all adjacent surfaces of the hold. As the nozzles are adjustable in the diffusion sections a most effective spray pattern of the wash water can be maintained.

With the above described form of service unit all division plates separating the various sections from the diffusion sections are eliminated together with internal tubes connecting the tubular sections with each other in order to bypass the diffusion sections, as was necessary when the tubular sections provided the required heating surface.

By using the tubular sections for wash water, a greater volume of water can be used in order to complete the washing of the water in a minimum of time.

By feeding the steam directly down to the bottom of...
the service unit and forming the heating coils about the lower tubular sections of the service unit, more direct and efficient heating of the cargo oil is obtained with greatly reduced consumption of steam.

What we claim is:

1. A service unit for installation within the hold of a bulk carrier vessel, the said service unit comprising a vertically disposed tubular structure having its upper end supported at deck level and its lower end located at the bottom of the hold of the vessel, the said tubular structure having a series of wash water diffusion sections located at spaced intervals lengthwise of the tubular structure and in communication therewith, nozzles in the said diffusion sections, means to feed wash water to the said tubular structure and diffusion sections, heating means associated with said tubular structure, the said heating means comprising a steam pipe extending downwards through said tubular structure and diffusion sections, the lower end of the said steam pipe passing through the wall of the said tubular structure at the lower end thereof and coiled into an upwards direction about the said tubular structure so that at least a part of the length thereof, means to feed steam to the said steam pipe, and a condensate return pipe extending upwards from the upper end of the said coiled portion of the said steam pipe.

2. A service unit as set forth in claim 1 in which the said tubular structure comprises a series of tubular sections and the said diffusion sections are interposed between adjacent ends of the tubular sections.

3. A service unit as set forth in claim 1 in which the coiled portion of the steam pipe is coiled about at least two of the lowermost sections of the service unit.

4. A service unit as set forth in claim 1 in which the said service unit has a service head at its upper end in which the upper end of the upper end of the said tubular sections is secured and in which the upper end of the said steam pipe and the said condensate return pipe are also secured.

5. A service unit as set forth in claim 4 in which the said service head includes an upper cap plate disposed at right angles to the axis of the service unit to seal the upper end of the said tubular section and a circular plate secured about said upper tubular member parallel and spaced downwards from the said cap member.

6. A service unit as set forth in claim 5 in which the said cap plate includes a steam passage communicating with the upper end of the said steam pipe, and a condensate return passage communicating with the said condensate return pipe.

7. A service unit for installation within the hold of a bulk carrier vessel in combination a hatch cover for the hold of the said vessel, a service unit mounted in said hatch cover, the said service unit comprising a vertically disposed tubular structure having its upper end supported in said hatch cover and its lower end located at the bottom of the hold of the vessel, the said tubular structure having a series of diffusion sections at spaced intervals lengthwise of the tubular structure and in communication therewith, nozzles in the said diffusion sections, means to feed wash water through said hatch cover to the said tubular structure and diffusion sections, heating means associated with said tubular structure, the said heating means comprising a steam pipe extending downwards through the said tubular structure and diffusion sections, the lower end of the said steam pipe passing through the wall of the said tubular structure at the lower end thereof and coiled in a upwards direction about the said tubular structure for at least a part of the length thereof, means to feed steam through the said hatch cover to the said steam pipe, and a condensate return pipe extending upwards from the upper end of the said coiled portion of the said steam pipe and through the said hatch cover.

8. A service unit as set forth in claim 7 in which the said hatch cover is provided with a housing having a central wash water compartment, a steam compartment and a condensate compartment, and means external to the said hatch cover connecting the said compartments respectively with a wash water main, a steam main and a condensate return main.

9. A service unit assembly as set forth in claim 7 in which a service unit is mounted in each corner of the said hatch cover.

10. A service unit as set forth in claim 8 in which the said service unit is provided with a service head, the said service head forming a connection between the said wash water compartment, the interior of the said tubular structure, the said steam compartment and the said steam pipe, and between the said condensate return pipe and the said condensate compartment.

11. A service unit as set forth in claim 10 in which the said service head includes an upper cap plate disposed at right angles to the axis of the service unit to seal the upper end of the said tubular structure, the said cap plate having a steam passage therein communicating with the said steam compartment and with the upper end of the said steam pipe, and a condensate passage therein communicating with the upper end of the said condensate return pipe and the said condensate compartment.

12. A service unit as set forth in claim 10 in which the said wash water compartment is an opening in said hatch cover, a cap plate on the top of said service unit seals the top of the said opening in the hatch cover, and a circular ring positioned about the said tubular structure at a spaced distance below the said cap plate makes sealing contact with a sealing ring on said hatch cover to form the said wash water compartment, and the tubular structure has an aperture therein providing communication between the interior of the tubular structure and the said wash water compartment.

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CHARLES A. WILLMUTH, Primary Examiner.
ROBERT L. BLEUTGE, Assistant Examiner.