Nov. 26, 1963 C. W. TAYLOR 3,112,097

FAIRLEADS FOR CABLES AND ROPES

Filed June 21, 1960 3 Sheets-Sheet 1

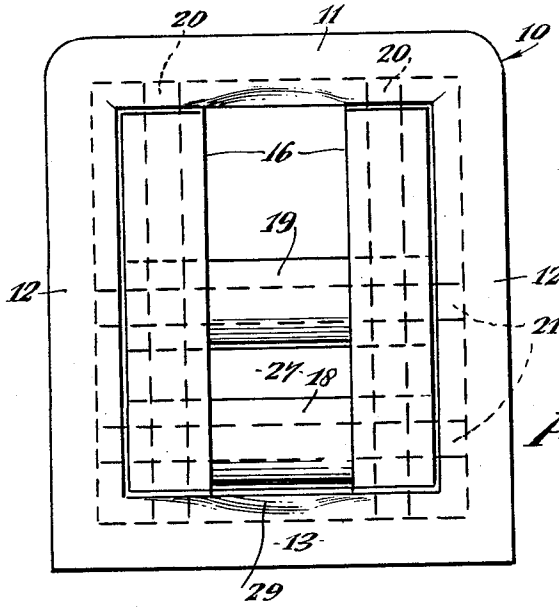


Fig. 1.

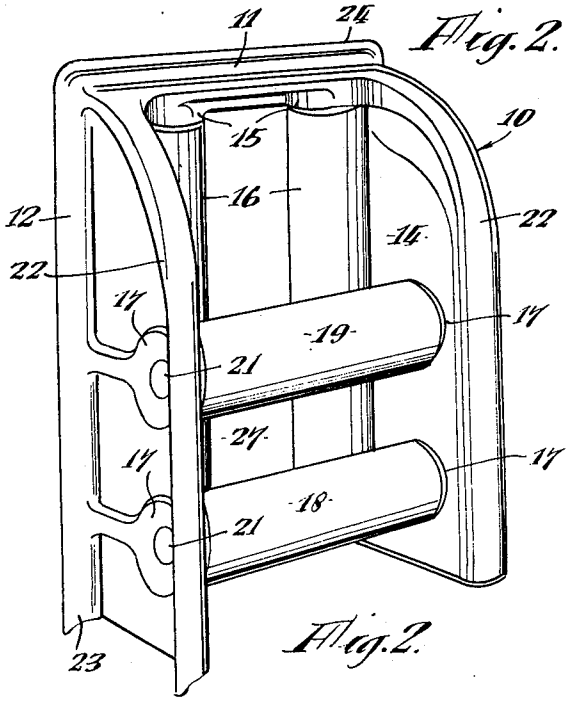


Fig. 2.

Fig. 2.

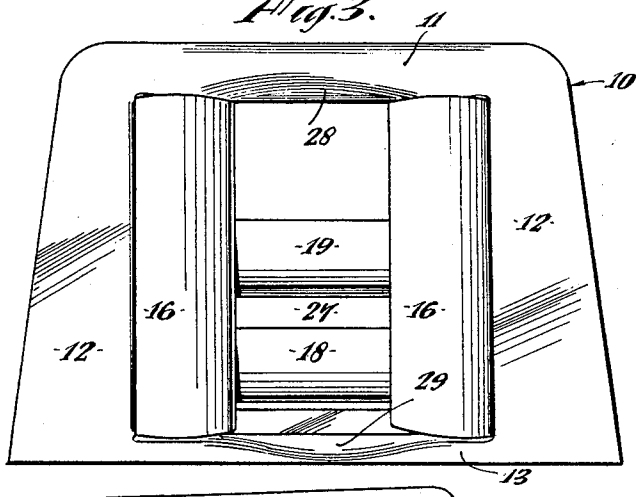
Inventor
Charles William Taylor
By Albert W. Jacobs
Attorney

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FAIRLEADS FOR CABLES AND ROPES

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Fig. 3.



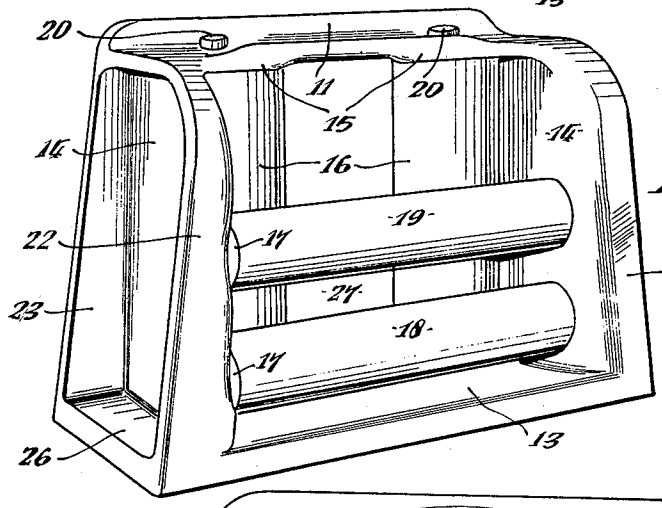


Fig. 4.

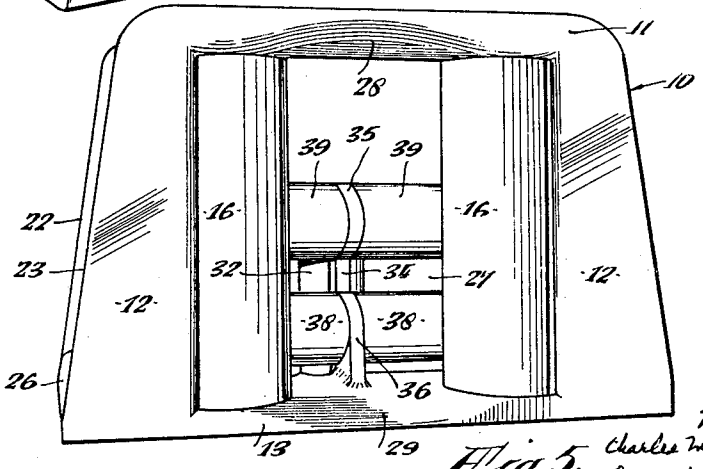


Fig. 5.

Inventor
Charles William Taylor
by Albert W. Jacobs
Attorney

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FAIRLEADS FOR CABLES AND ROPES

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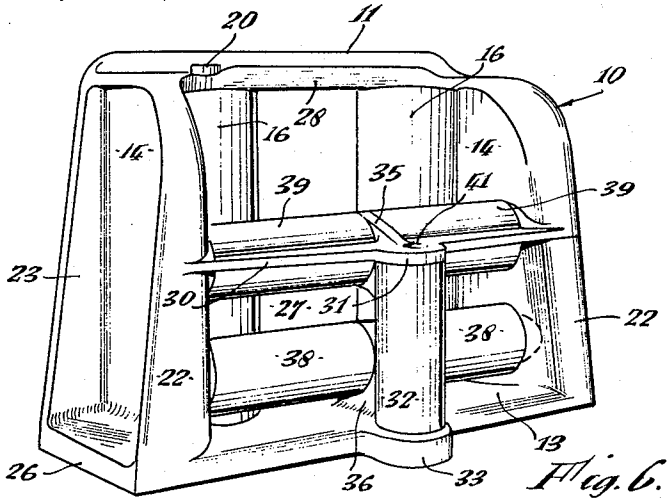


Fig. 6.

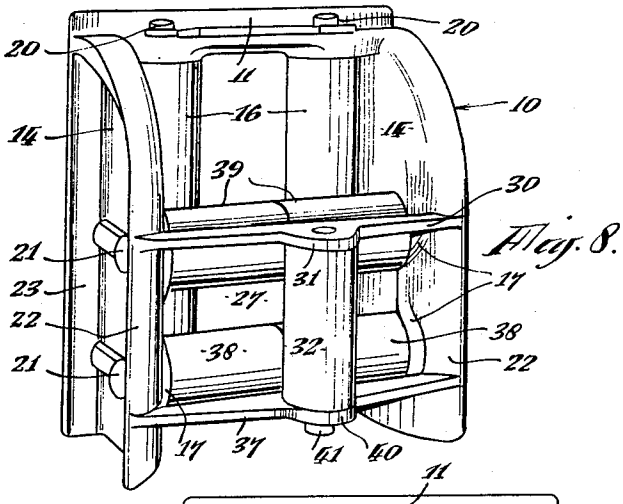


Fig. 8.

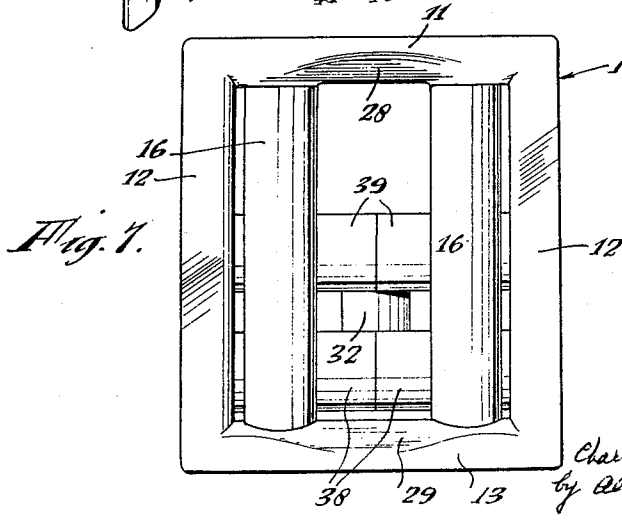


Fig. 7.

Inventor
Charles William Taylor
by Albert Z. Jacobs
Attorney

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3,112,097

FAIRLEADS FOR CABLES AND ROPES

Charles William Taylor, Dunston-on-Tyne, England, assignor to Taylor, Pallister & Co. Limited, Dunston-on-Tyne, England

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4 Claims. (Cl. 254—190)

This invention relates to fairleads for cables and ropes, more particularly for use in guiding ships' mooring ropes, and provides an improved and simplified fairlead which enables a cable or rope to lie outwards from the fairlead within a wide angular range horizontally, vertically and obliquely, and yet is of simple and robust construction and capable of withstanding severe conditions of use and climate, for example, as experienced on seagoing ships.

An object of the invention is to provide a fairlead, adapted to enable deflections of mooring cables in use when a ship is being passed through deep locks, such as are now provided with lifts of 50 feet and higher, comprising a frame including horizontal top and bottom members and a pair of vertical side members, a pair of inboard horizontal rollers mounted one above the other between said side members and a pair of substantially vertical outboard rollers mounted between said top and bottom members, said two pairs of rollers being wholly disposed between the inboard and outboard limits of said frame.

Preferably, said frame presents a smooth uninterrupted outer face, of which all the margins are rounded, and said two pairs of rollers are wholly disposed on the inboard side of said face, i.e. that side of the frame which is directed towards a winch.

The horizontal rollers may be more closely spaced than the vertical rollers, so as to afford a wide rectangular opening for the passage of a mooring cable, and for an eye on the end of such a cable. Further, since a ship in a deep lock will usually ride less above than below the level of bollards to which the mooring cables are attached, so that such cables will not normally extend obliquely forward or aft of the fairlead at a large downward angle, the pair of horizontal rollers may be disposed towards the lower ends of the pair of vertical rollers. The upper ends of the latter may extend above the upper horizontal roller so as to be capable of guiding a cable at a large upward angle obliquely forward or aft.

A further object of the invention is to provide a fairlead as aforesaid modified to serve for simultaneously guiding two independently movable cables or ropes, said fairlead comprising a frame including horizontal top and bottom members and a pair of vertical side members, a pair of inboard horizontal rollers, each comprising two independently rotatable, co-axial roller sections, mounted one above the other upon said side members, a pair of substantially vertical outboard rollers mounted upon said top and bottom members, said two pairs of rollers being wholly disposed on the inboard side of said frame, and another substantially vertical roller extending between the levels of the bottom of the lower horizontal roller and the top of the upper horizontal roller mounted at the middle of the inboard side of said horizontal rollers.

Embodiments of fairleads according to the invention will be described by way of example with reference to the accompanying drawings, wherein—

FIG. 1 is a front or outboard elevation of one embodiment, and

FIG. 2 is a rear or inboard perspective view thereof;

FIGS. 3 and 4 are similar views of another embodiment;

FIGS. 5 and 6 are similar views of another, modified embodiment, and

FIGS. 7 and 8 are similar views of an alternative modified embodiment.

In the embodiment shown in FIGS. 1 and 2, a frame **10** consists of a unitary steel casting comprising a top member **11**, a bottom member **13**, and lateral channel section members **12** with inwardly projecting webs **14** having inboard flanges **22** the upper ends of which are curved to merge smoothly into the ends of the top member **11**. The frame provides a vertical web **24** of said top member **11** and lateral outboard flanges **23** of the side members **12** in a common plane, presenting a plane face web of which all the internal and external edges are rounded.

A pair of vertical rollers **16** are mounted in cylindrical lugs **15** at top and bottom, and a pair of horizontal rollers **18, 19** are mounted in enlargements **17** on the webs **14**. The ends of the spindles **20** of the vertical rollers **16** are accessible at apertures in the upper surface of the horizontal web of the top member **11**, while the ends of spindles **21** of the horizontal rollers are accessible at the outer sides of the webs **14**. All four rollers are cylindrical and as shown have the same diameter. The horizontal rollers **18** and **19** are mounted with their axes in one substantially vertical plane so that their peripheries are spaced apart by about one half of a diameter. The vertical rollers **16** are mounted in a substantially parallel plane, and so that their peripheries are spaced apart by about 2 diameters, said peripheries being close to the peripheries of the horizontal rollers. The lower ends of the vertical rollers **16** are substantially level with the lower arc of the lower horizontal roller **18**, and the upper ends of said vertical rollers extend by about 1½–2 diameters above the upper arc of the upper horizontal roller **19**. The spindles **20, 21** respectively pass through said rollers and their respective mountings **15, 17** so that any one of the rollers is removable for replacement or repair by withdrawal of its spindle, the ends of which are freely accessible. Said ends of the spindles may be fitted in bronze bushes and lubricated by grease nipples (not shown).

The embodiment of fairlead according to the invention illustrated in FIGS. 1 and 2 is adapted to be inserted in an aperture in a ship's bulwark plating, the plane face web **14** being securable to said plating in any convenient manner. It may for example be secured by welding externally of said plating, and further welding may if desired be effected in the angles between the interior of said plating and the inwardly projecting horizontal webs of the members **11, 12** and **13**. Alternatively, such a fairlead may be secured to said plating by bolts or rivets, the vertical webs of the members **11, 12** and **13** being suitably dimensioned for this purpose.

In the modification shown in FIGS. 3 and 4, the vertical rollers **16** are made larger in diameter (for example with a diameter of at least 300–350 mm.) to comply with regulations of the Panama Canal authority. The horizontal rollers **18** and **19** are mounted with their axes in one substantially vertical plane so that their peripheries are spaced apart by about one half of their diameter. The vertical rollers **16** are mounted in a substantially parallel plane, and so that their peripheries are spaced apart by about 1½ times their larger diameter, said peripheries being close to the peripheries of the horizontal rollers. The lower ends of the vertical rollers **16** are substantially level with the lower arc of the lower horizontal roller **18**, and the upper ends of said vertical rollers extend by about 1½–2 times the smaller diameter of said horizontal rollers above the upper arc of the upper horizontal roller **19**. The vertical and horizontal rollers are mounted on spindles which pass through said rollers and their respective mountings as above described so that any one of the rollers is removable for replacement or repair by withdrawal of its spindle, the ends of which are freely accessible.

The frame **10** is made, to accommodate the larger rollers **16** spaced to afford an elongated rectangular opening **27**, as a wide unitary casting, wherein the flanges **22**, **23** of the side members **12** diverge to a wide base as shown. Between the lower ends of said flanges **22** and **23** are provided horizontal flange members **26** so that the fairlead can stand firmly upon a ship's deck and support the strains imposed by a cable extending in either direction laterally. Further to comply with said regulations, the rounding **28** of the middle portion of the top member of the frame may have a relatively large radius (for example, a radius of at least 150–175 mm.).

A fairlead constructed as either of the embodiments above described is adapted to be mounted on board ship so as to receive between the inboard pair of horizontal rollers **18**, **19**, a mooring cable extended from a winch and passed outboard between the pair of vertical rollers **16** to a bollard. As shown, the horizontal rollers are more closely spaced than the vertical rollers so as to afford said wide rectangular opening **27** for the passage of such a mooring cable, and for an eye on the end thereof.

When such a fairlead is substantially aligned between the winch and a bollard, a mooring or warping cable can extend from between the horizontal rollers to the bollard, horizontally or at an upward or downward inclination, without touching either of the vertical rollers. Extensive rounding **28** of the top member and rounding **29** of the bottom member of the frame, between the ends of said vertical rollers **16**, enables the cable when so disposed to extend at a large upward or downward angle without fouling the frame.

When taken to a bollard forward or aft of the line from the winch to the fairlead, the cable after passing through the aperture **27** is deflected partly round one or other of the vertical outboard rollers **16**. The disposition of the latter rollers permits the cable in such a position to extend forward or aft obliquely at a downward angle of as much as 45° or an upward angle of as much as about 80°. This arrangement provides adequate guidance for a cable from a ship to a bollard in a deep lock, throughout the displacement of a ship from riding high above the wall of a filled lock to lying deep within the lock when the water level has been lowered.

Alternatively in the use of a fairlead, a large cable, or a smaller cable when subjected to severe downward bending, can be passed through the fairlead over the top of the upper horizontal roller **19**. Should the need arise, it is possible to pass more than one rope through the fairlead, for example, one through the aperture **27** between the horizontal rollers **18**, **19**, and one through the space between the upper roller **19** and the top member of the frame, provided that they diverge on the outboard side.

In a modified fairlead as shown in FIGS. 5 and 6, adapted to comply with other regulations concerning the simultaneous location of two ropes within the wide rectangular gap **27** afforded between the two pairs of rollers, each of the horizontal rollers may be divided at its middle, so as to comprise a pair of individually rotatable halves **38**, **39**. Extending between the inboard flanges **22** of the lateral channel members **12** of the frame **10** is a horizontal transverse web **30** comprising at its middle a mounting **31** for the upper end of another vertical roller **32**, and the bottom member **15** has at its inboard side an extension **33** to provide a mounting for the lower end of said roller **32**. Said web member **30** is mounted between the levels of the axis and the upper arc of the upper horizontal rollers **39**. The relatively short vertical roller **32** thus divides the said wide gap **27** into two portions, each of which constitutes a channel for one of two ropes which may thereby be freely movable independently and if desired in opposite directions through the fairlead, primarily so that these ropes can diverge from the outboard face of the fairlead to separate bollards at a mutual angle that may be as large as 180°.

Since there is between the horizontal rollers **38**, **39** and said inboard vertical roller **32** a dead space which can never in any circumstances be entered by a rope guided by any plurality of the assembly of five rollers as described, there is provided in this space, between the transverse web **30** and the base **13**, a vertical bracing element **34** to support the middle of said web, and presenting outwardly upper and lower mountings **35**, **36** for the middles of the spindles of the horizontal rollers. It is not necessary to make the horizontal roller sections **38**, **39** or the fifth vertical roller **32**, as large as the vertical rollers **16**, since it is not normally possible for a rope passing from a winch through the fairlead to be bent tightly around the periphery of any one of the latter three rollers.

FIGS. 7 and 8 illustrate a similarly modified, smaller fairlead of the kind above described with reference to FIGS. 1 and 2. In this modification, where the horizontal web of the bottom member **13** does not extend inwardly as far as the inboard flanges **22** of the side members, there is provided, substantially at the level of the lower arc of the lower roller sections **38**, a second transverse web **37** having at its middle a mounting **40** for the lower end of the spindle **41** of said roller **32**. Since the spindles **21** of the horizontal rollers **38**, **39** are in this embodiment relatively short, it is not necessary to provide a vertical brace **34** with mountings **35**, **36** as shown in FIGS. 5 and 6.

It will be observed that in a fairlead according to any of the embodiments described, all the rollers are wholly disposed at the inboard side of the face outwardly presented by the frame. This outer face as seen in any of FIGS. 1, 3, 5 or 7 is smooth and uninterrupted and all its margins above deck level are preferably rounded; particularly, as stated, the portions **28** and **29** of the top and bottom members between the upper and lower ends respectively of the vertical rollers are rounded to a relatively large radius. Also the inboard lateral flanges **22** of the channel side members merge throughout their upright and upper curved parts with a substantial rounding into the webs **14** of said side members, so that a rope taken from a bitt, situated on the ship's deck either forward or aft of the fairlead, to a towing vehicle or "mule" has not to be bent around a sharp angle or radius of the frame. Further, when such rope extends upwards or downwards at an angle from the outboard side of said fairlead to said towing vehicle it must pass obliquely around part of one of the horizontal rollers, and the elliptical oblique section thereof affords a guiding curve less acute than that of the circular transverse section.

The invention provides an improved and simplified construction of fairlead capable of easy and economical manufacture, while being robust and providing an unobstructed outlet for a cable or rope within a wide conical ambit from the wide aperture **27** defined by the two pairs of rollers. Further, the rollers are so mounted, all on the inboard side of the frame, as to be easily removable for replacement or repair, when worn or damaged.

What I claim and desire to secure by Letters Patent is:

1. A fairlead for cables and ropes, comprising a rectangular frame including horizontal top and bottom members and a pair of vertical side members, a pair of inboard horizontal rollers, each comprising two independently rotatable, co-axial roller sections, mounted one above the other upon said side members, a pair of vertical outboard rollers mounted upon said top and bottom members, said two pairs of rollers being wholly on the inboard side of said frame, said horizontal rollers being more closely spaced than said vertical rollers to afford a wide rectangular opening defined by said pairs of rollers, said top and bottom members between the upper and lower mountings of said vertical rollers being inwardly and smoothly recessed, and another vertical roller mounted at the middle of the inboard side of said horizontal rollers and traversing said rectangular opening.

2. A fairlead for cables and ropes according to claim 1 wherein the defined rectangular opening is wider than the diameter of the rollers and wherein said other vertical roller extends from the level of the bottom of the lower horizontal roller at least to the level of the axis of the upper horizontal roller.

3. A fairlead for cables and ropes according to claim 1 wherein said pair of vertical side members presents a smooth, uninterrupted outer face whereof all margins are rounded, and wherein the defined rectangular opening is wider than the diameter of the rollers.

4. A fairlead for cables and ropes according to claim 1 wherein said horizontal and vertical side members are L-sectioned and jointly present a plane rectangular face web, wherein said horizontal rollers are mounted one above the other in inwardly projecting webs of said side members, wherein said vertical rollers are mounted in inwardly projecting webs of said top and bottom members, said two pairs of rollers being wholly on the inboard side of said face web, said horizontal rollers being disposed toward the lower ends of said pair of vertical rollers and

extending transversely between the inboard margins of said side members, the upper ends of said vertical rollers extending above the upper horizontal roller a distance not less than 1½ times the diameter of one of said horizontal rollers, the defined rectangular opening being wider than the diameter of the rollers.

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