

PATENT SPECIFICATION

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(54) IMPROVED LINE THROWING EQUIPMENT

(71) We, SCHERMULY LIMITED, a British Company, of Spra Works, Newdigate, Dorking, Surrey, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following Statement:—

This invention relates to an improved line-throwing equipment comprising a housing which accommodates a rocket discharger and a flaked line.

Self-contained line-throwing equipments are known in which an annular container for a flaked line is disposed coaxially around a discharger barrel from which a line-throwing rocket can be discharged. The bridle of the rocket is attached to the flaked line so that when the rocket is fired from the barrel the line is drawn out of the annular container.

In these known line-throwing equipments it has always proved a difficult matter to achieve a satisfactory connection between the free end of the flaked line, which is located in the annular container at the end of the latter adjacent to the open end of the barrel, and the rear end of the line attachment bridle which, immediately prior to firing of the rocket is disposed near the closed end of the barrel. The reason for this is that the connecting means, for example a length of rope, between the line and the rocket bridle has to be accommodated in the confined space between the external surface of the rocket casing and the internal surface of the wall of the discharger barrel, or else the latter has to be provided with a longitudinal groove to accommodate the connecting means.

The present invention aims to provide an improved line-throwing equipment which facilitates connection of the flaked line to the rocket.

According to the invention, a line-throwing

equipment comprising a housing, a rocket discharger within the housing and a flaked line within the housing, is characterised in that the rocket discharger comprises three or more guide rails fixed relative to the housing and each having a guiding surface located on a different generatrix of an imaginary circular cylindrical surface, the guiding surfaces being spaced at equal or substantially equal angular intervals around said imaginary cylindrical surface.

Preferably there are three guide rails and the guide rails may be in the form of straight strips of rectangular cross-section, made of metal or plastics material.

The guide rails may be fixed to, or formed integrally with the internal surface of a circular cylindrical tube which is itself fixed relative to the casing. For example, the guide rails may be welded or brazed to the internal surface of a cylindrical metal tube, or the cylindrical tube may be an extruded product with said guide rails forming part of the extruded section. This cylindrical tube may form the inner wall of a container of annular cross-section which houses said flaked line. In this case the line is flaked into the annular container in layers from one end of the container, both ends of the flaked line being left free at or adjacent to the other end of the annular container.

In use of the equipment in accordance with the invention a line-throwing rocket has its bridle connected to the free end of the flaked line by any suitable connecting means, for example a length of rope, and the rocket is entered into the cylindrical space defined by said imaginary cylindrical surface, the rocket being entered into said space, choke end first, from the end of the guide rails disposed adjacent to the free end of the flaked line. The line connecting means and any parts of the rocket bridle which extend radially beyond the confines of the rocket casing are readily accom-

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modated in the spaces lying between adjacent guide rails outside said imaginary cylindrical surface.

Line-throwing equipments of the kind with which this invention is concerned are usually provided with a percussion igniter mechanism which serves to ignite the propellant charge of a rocket placed in the discharger. A preferred embodiment of the line-throwing equipment of this invention is provided with a percussion igniter mechanism comprising an apertured plate secured to said housing, a percussion igniter within the housing and spaced from and fixed relative to said apertured plate, an elongated striker having a firing tip at one end and its opposite end portion passing through the aperture in said plate, spring means engaged with the striker and arranged, when stressed, to urge the striker in a first direction to cause the firing tip to move away from said plate into engagement with said igniter, and a keeper member slidably mounted for movement into and out of engagement with said opposite end portion of the striker to prevent or allow, respectively, movement of the striker in said first direction, said opposite end portion of the striker and said keeper member being provided with cooperating cam surfaces whereby, when the keeper member is moved out of engagement with the striker, the latter is forced by said cam surfaces to move in the direction opposite to the first direction to stress the spring means and then released to enable the spring means to assert itself and drive the striker in said first direction to cause its firing tip to engage the igniter.

The striker may be housed in a tubular housing which is closed at one end by said apertured plate and has the igniter mounted at its other end. The spring means is then suitably a helical spring within the tubular housing which surrounds the striker and is arranged to bear at one end against the apertured plate and at its other end against an enlarged head of the striker which carries said firing tip.

Suitably the keeper member is a strip of metal slidably mounted in a diametral groove formed in the surface of said apertured plate remote from the firing tip of the striker and is slidable through a slot formed in said opposite end portion of the striker. This strip is provided with a cam surface which cooperates with the end of the slot in the striker lying remote from the firing tip.

A suitable trigger mechanism may be mounted on the housing and connected to said keeper member for the purpose of moving the keeper member out of engagement with the striker.

The invention will now be described in greater detail, by way of example, with reference to the drawing accompanying the Provisional Specification, in which

Figure 1 is a sectional elevation of a line-throwing equipment in accordance with the invention,

Figure 2 is a sectional view taken on the line II-II of Figure 1,

Figure 3 is a sectional elevation, on an enlarged scale, of the percussion igniter mechanism of the equipment of Figure 1, showing the parts in the position they adopt during storage of the equipment.

Figure 4 is a view similar to Figure 3, but showing the parts in the position they adopt immediately prior to initiation of the percussion igniter, and

Figure 5 is a section taken along the line V-V of Figure 3.

The line-throwing equipment shown in Figures 1 and 2 comprises a housing formed by a tube 1 of circular cross-section, made, for example, of a plastics material, and having an annular plate 2 adjacent one end 3. The plate 2 may be moulded integrally with the tube 1.

Coaxially disposed within the tube 1 is a second tube 4 of circular cross-section which extends from the annular plate 2 almost to the other end 5 of the tube 1. The tube 4 may be made of any suitable material, for example metal or plastics material, and the annular space 6 between the tubes 1 and 4 is occupied by a line 7 which is flaked into the space 6 starting at the annular plate 2 and proceeding in the direction towards the end 5 of the tube 1. Both ends of the line, hereinafter referred to as the rocket end of the line and the loop end of the line, respectively, are brought to the end 5 of the tube 1. Removable end caps 8, 9 of transparent plastics material are fitted over the ends 3, 5, respectively, of the tube 1.

On the external surface of the tube 1, for example moulded integrally with the tube 1, is a handle 10 by means of which the equipment is held during use.

Projecting radially inwards from the internal surface of the tube 4 are three longitudinally disposed guide rails 11, 11a and 11b. Each of these rails has an inwardly facing guiding surface 12 located on a different generatrix of an imaginary circular cylindrical surface, indicated by the chain line 13 in Figure 2. The rails 11, 11a and 11b are preferably strips of rectangular cross-section and they may be made of any suitable material, for example metal or plastics material. These rails may be fixed to the tube 4 in any suitable manner, for example welded, brazed, riveted or screwed. Alternatively, the tube 4 and the rails may be formed integrally

with one another.

Housed within the tube 4 is a line-carrying rocket 14 having a casing 15 of circular cross-section. The rocket has a conventional bridle consisting of rods 16, 16a secured to the casing 15 and a stirrup 17 pivoted to the rearward ends of the rods 16, 16a. A connecting member 18, for example a length of rope, joins the stirrup 17 to the rocket end of the line 7 located near the end 5 of the tube 1.

As can be seen from Figure 2, the casing 15 of the rocket 14 is disposed in the tube 4 within the imaginary cylinder defined by the line 13. The bridle rods 16, 16a are located in the annular space between the internal surface of the tube 4 and the imaginary cylindrical surface defined by the line 13, the rod 16 being located between the rails 11 and 11b and the rod 16a being between the rails 11 and 11a. The stirrup 17 rests on the guiding surfaces 12 of the rails 11a, 11b and the connecting member 18, throughout most of its length, lies in the space between the rails 11a and 11b.

The end of the tube 4 adjacent to the annular plate 2 is occupied by a percussion igniter mechanism generally designated by the reference numeral 20. The latter comprises a tubular housing 21 having an apertured circular plate 22 at one end, the plate 22 being let into a counterbored portion 23 of the tube 4 with its outwardly-facing surface 24 standing proud of the outwardly-facing surface 25 of the annular plate 2. As will be seen most clearly from Figures 3 and 4, the end 26 of the tubular housing 21 is closed by a cap 27 having a central aperture 28 therein and a percussion igniter 29 is mounted in the housing 21 adjacent to the cap 27. As can be seen from Figure 1, the apertured cap 27 is located closely adjacent to the choke end 30 of the rocket 14.

Within the housing 21 is a striker 31 having, at one end, an enlarged head 32 provided with a firing tip 33. Adjacent its other end the striker has a slot 34 extending therethrough. A helical spring 35 surrounds the striker shank 36 and bears at one end on the head 32 and at the other end on the plate 22.

The plate 22 has a central aperture 37 formed therein and a diametral groove 38 formed in its outwardly-facing surface 24. The slotted end of the striker 31 projects through the aperture 37 and a keeper member, generally designated by the reference numeral 39, which is slidably mounted in the groove 38, passes through the slot 34 in the striker.

The keeper member 39 is made from strip material and has a first portion 40 with parallel side edges 41 and 42. Integrally formed with the first portion 40 is a second

portion 43 having side edges 44 and 45 which are inclined towards each other in the direction towards the junction between the portions 40 and 43, the side edges 41 and 44 being aligned with one another. At its free end the portion 40 has a hole 46 which receives the bent end of a rod 47. At its end remote from the keeper member the rod 47 is pivotally connected to a firing lever 48 which is itself pivoted at 49 to the handle 10.

Figures 1 and 3 show the parts of the line-throwing equipment in the positions they occupy during storage of the equipment. In this condition of the equipment a safety pin 50 can be passed through aligned holes in the firing lever 48 and the handle 10 to prevent actuation of the firing lever 48. With the firing lever in this safety position the keeper member 39 has its portion 40 engaged in the striker slot 34 with the side edge 42 engaging the end 51 of the slot 34. The firing tip 33 of the striker is held close, but in safe relationship, to the igniter 29 and the spring 35 is only under light compression.

When the equipment is to be used, the pin 50 is removed and the firing lever 48 is pivoted around the pivot 49 in the direction of the arrow A. This has the effect of moving the keeper member in the direction of the arrow B (see Figure 3) and Figure 4 shows the positions of the parts of the igniter mechanism immediately prior to firing of the igniter 29. In this Figure it will be seen that the portion 43 of the striker has almost moved through the striker slot 34 with the result that the side edge 45 acting as a cam surface on the end 51 of the slot 34 has moved the striker 31 to the right, compared with Figure 3, to stress the spring 35. Further movement of the keeper member in the direction of the arrow B causes the portion 43 to move out of the slot 34 so that the spring 35 can re-assert itself and drive the striker to the left, as viewed in Figures 3 and 4, so that the firing tip 33 is driven against the igniter 29. A flash from the igniter 29 passes through the aperture 28 into the choke end 30 of the rocket 14 so that the propellant charge of the latter is ignited. The rocket then travels out of the tube 4, guided by the guiding surfaces 12, the cap 9 having been removed immediately prior to commencement of the firing operation, and the loop end of the line 7 having been secured to a coil of heavy rope or to a static or heavy object, for example a ship's rail. As the rocket moves along the tube 4 the rods 16, 16a and the connecting member 18 have ample space in which to move without impeding the progress of the rocket. Furthermore, the annular space between the internal wall of the tube 4 and the external surface of the

rocket casing 15 allows the propellant gases to escape forwards, thus serving to reduce recoil forces on the equipment.

In order to avoid any danger of the rocket 5 and line falling out of the housing when the cap 9 is removed, the annular space 6 may be closed by a thin paper or plastics membrane 52 and the tube 4 may be closed by a thin end cap 53. The cap 53 is ruptured 10 by the rocket as it emerges from the tube 4 and the membrane 52 is ruptured by the line 7 as it is drawn from the space 6.

Both the rocket 14 and the igniter mechanism 20 are readily removable for replacement, for example when it is considered that the propellant charge of the rocket and the igniter 29 may have deteriorated during storage. Both the rocket and the igniter mechanism may be stamped with the dates when it is advisable to replace them, which dates can be viewed through the transparent caps 8 and 9.

WHAT WE CLAIM IS:—

25 1. A line-throwing equipment comprising a housing, a rocket discharger within the housing and a flaked line within the housing, characterised in that the rocket discharger comprises three or more guide rails 30 fixed relative to the housing and each having a guidance surface located on a different generatrix of an imaginary circular cylindrical surface, the guiding surfaces being spaced at equal or substantially equal angular intervals around said 35 imaginary cylindrical surface.

2. A line-throwing equipment according to claim 1, in which the guide rails are in the form of straight strips of rectangular cross-section.

3. A line-throwing equipment according to claim 1 or 2, in which the guide rails are fixed to, or formed integrally with the internal surface of a circular cylindrical 45 tube which is itself fixed relative to the casing.

4. A line-throwing equipment according to claim 3, in which the rails are welded or brazed to the internal surface of a 50 cylindrical metal tube.

5. A line-throwing equipment according to claim 3, in which the cylindrical tube is an extruded product with said guide rails forming part of the extruded section.

55 6. A line-throwing equipment according to any of claims 3 to 5, in which said tube forms the inner wall of a container of annular cross-section which houses said flaked line.

60 7. A line-throwing equipment according to claim 6, in which the line is flaked into the annular container in layers from end of the container, both ends of the flaked line being left free at or adjacent to the other 65 end of the annular container.

8. A line-throwing equipment according to any of the preceding claims, comprising a percussion igniter mechanism secured to said housing and serving to ignite the propellant charge of a rocket placed in the 70 discharger.

9. A line-throwing equipment according to claim 8, in which the igniter mechanism comprises an apertured plate secured to said housing, a percussion igniter within the 75 housing and spaced from and fixed relative to said apertured plate, an elongated striker having a firing tip at one end and its opposite end portion passing through the aperture in said plate, spring means engaged 80 with the striker and arranged, when stressed, to urge the striker in a first direction to cause the firing tip to move away from said plate into engagement with said igniter, and a keeper member slidably 85 mounted for movement into and out of engagement with said opposite end portion of the striker to prevent or allow respectively, movement of the striker in said first direction, said opposite end portion of the 90 striker and said keeper member being provided with cooperating cam surfaces whereby, when the keeper member is moved out of engagement with the striker, the latter is forced by said cam surfaces to move in the 95 direction opposite to the first direction to stress the spring means and then released to enable the spring means to assert itself and drive the striker in said first direction to cause its firing tip to engage the igniter. 100

10. A line-throwing equipment according to claim 9, in which the striker is housed in a tubular housing which is closed at one end by said apertured plate and has the 105 igniter mounted at its other end.

11. A line-throwing equipment according to claim 10, in which the spring means is a helical spring within the tubular housing which surrounds the striker and is arranged to bear at one end against the apertured 110 plate and at its other end against an enlarged head of the striker, which head carries said firing tip.

12. A line-throwing equipment according to any of claims 9 to 11, in which the keeper 115 member is a strip of metal slidably mounted in a diametral groove formed in the surface of said apertured plate remote from the firing tip of the striker and is slidable through a slot formed in said opposite end portion 120 of the striker, said strip being provided with a cam surface which cooperates with the end of the slot in the striker lying remote from the firing tip.

13. A line-throwing equipment according to 125 any of claims 9 to 12, comprising a trigger mechanism mounted on the housing and connected to said keeper member for the purpose of moving the keeper member out of engagement with the striker. 130



rocket casing 15 allows the propellant gases to escape forwards, thus serving to reduce recoil forces on the equipment.

In order to avoid any danger of the rocket 5 and line falling out of the housing when the cap 9 is removed, the annular space 6 may be closed by a thin paper or plastics membrane 52 and the tube 4 may be closed by a thin end cap 53. The cap 53 is ruptured 10 by the rocket as it emerges from the tube 4 and the membrane 52 is ruptured by the line 7 as it is drawn from the space 6.

Both the rocket 14 and the igniter mechanism 20 are readily removable for replacement, for example when it is considered that the propellant charge of the rocket and the igniter 29 may have deteriorated during storage. Both the 15 rocket and the igniter mechanism may be stamped with the dates when it is advisable to replace them, which dates can be viewed through the transparent caps 8 and 9. 20

WHAT WE CLAIM IS:—

25 1. A line-throwing equipment comprising a housing, a rocket discharger within the housing and a flaked line within the housing, characterised in that the rocket discharger comprises three or more guide rails 30 fixed relative to the housing and each having a guidance surface located on a different generatrix of an imaginary circular cylindrical surface, the guiding surfaces being spaced at equal or substantially equal angular intervals around said 35 imaginary cylindrical surface.

2. A line-throwing equipment according to claim 1, in which the guide rails are in the form of straight strips of rectangular 40 cross-section.

3. A line-throwing equipment according to claim 1 or 2, in which the guide rails are fixed to, or formed integrally with the internal surface of a circular cylindrical 45 tube which is itself fixed relative to the casing.

4. A line-throwing equipment according to claim 3, in which the rails are welded or brazed to the internal surface of a 50 cylindrical metal tube.

5. A line-throwing equipment according to claim 3, in which the cylindrical tube is an extruded product with said guide rails forming part of the extruded section.

55 6. A line-throwing equipment according to any of claims 3 to 5, in which said tube forms the inner wall of a container of annular cross-section which houses said flaked line.

60 7. A line-throwing equipment according to claim 6, in which the line is flaked into the annular container in layers from end of the container, both ends of the flaked line being left free at or adjacent to the other 65 end of the annular container.

8. A line-throwing equipment according to any of the preceding claims, comprising a percussion igniter mechanism secured to said housing and serving to ignite the propellant charge of a rocket placed in the 70 discharger.

9. A line-throwing equipment according to claim 8, in which the igniter mechanism comprises an apertured plate secured to said housing, a percussion igniter within the 75 housing and spaced from and fixed relative to said apertured plate, an elongated striker having a firing tip at one end and its opposite end portion passing through the aperture in said plate, spring means engaged 80 with the striker and arranged, when stressed, to urge the striker in a first direction to cause the firing tip to move away from said plate into engagement with said igniter, and a keeper member slidably 85 mounted for movement into and out of engagement with said opposite end portion of the striker to prevent or allow respectively, movement of the striker in said first direction, said opposite end portion of the 90 striker and said keeper member being provided with cooperating cam surfaces whereby, when the keeper member is moved out of engagement with the striker, the latter is forced by said cam surfaces to move in the 95 direction opposite to the first direction to stress the spring means and then released to enable the spring means to assert itself and drive the striker in said first direction to cause its firing tip to engage the igniter. 100

10. A line-throwing equipment according to claim 9, in which the striker is housed in a tubular housing which is closed at one end by said apertured plate and has the 105 igniter mounted at its other end.

11. A line-throwing equipment according to claim 10, in which the spring means is a helical spring within the tubular housing which surrounds the striker and is arranged to bear at one end against the apertured 110 plate and at its other end against an enlarged head of the striker, which head carries said firing tip.

12. A line-throwing equipment according to any of claims 9 to 11, in which the keeper 115 member is a strip of metal slidably mounted in a diametral groove formed in the surface of said apertured plate remote from the firing tip of the striker and is slidable through a slot formed in said opposite end portion 120 of the striker, said strip being provided with a cam surface which cooperates with the end of the slot in the striker lying remote from the firing tip.

13. A line-throwing equipment according to any of claims 9 to 12, comprising a 125 trigger mechanism mounted on the housing and connected to said keeper member for the purpose of moving the keeper member out of engagement with the striker. 130

14. A line-throwing equipment constructed and arranged substantially as herein described with reference with to the drawing accompanying the provisional specification.

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