Dec. 19, 1961 P. B. FONDÉN ET AL 3,013,750

RAISING DEVICE FOR AIRPLANE ARRESTING NETS

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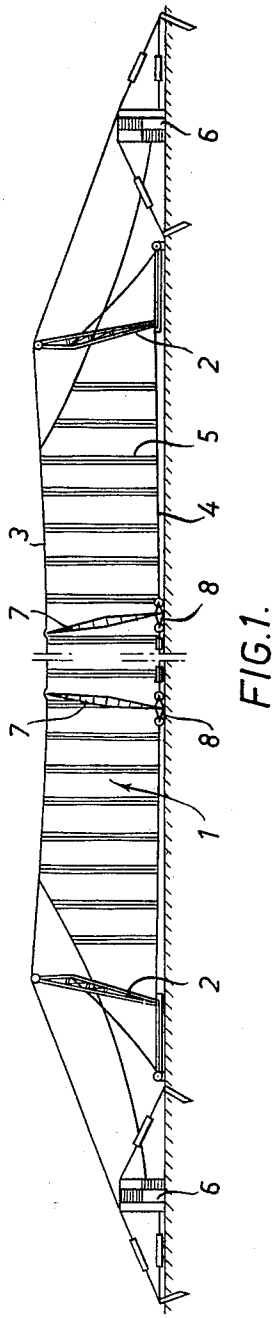


FIG. 1.

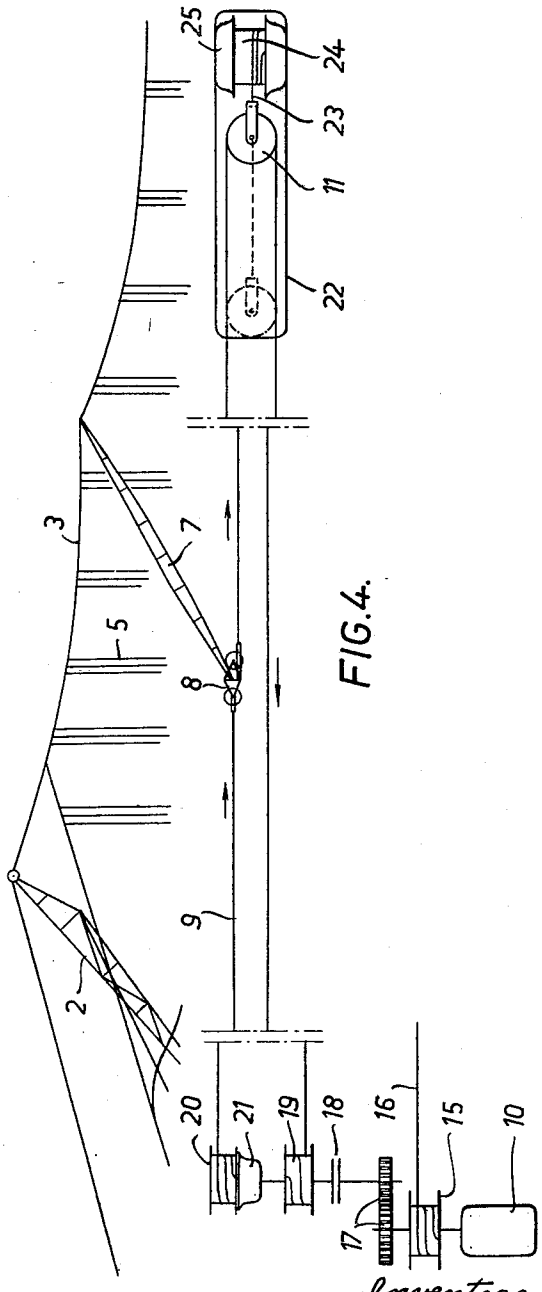


FIG. 4.

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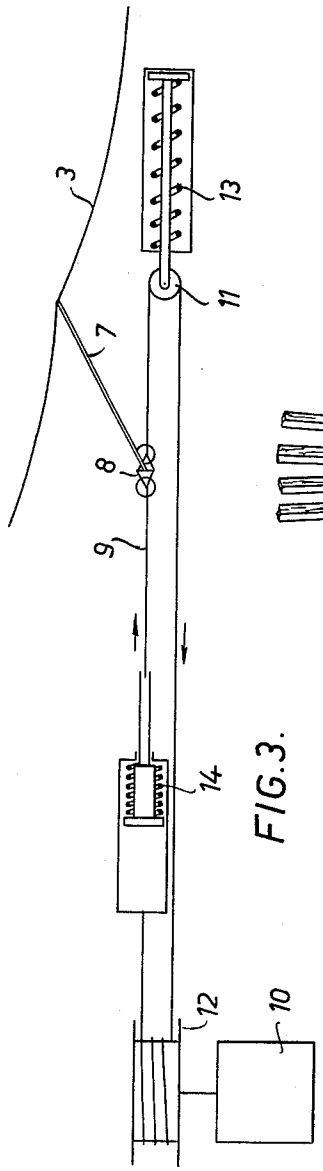


FIG. 3.

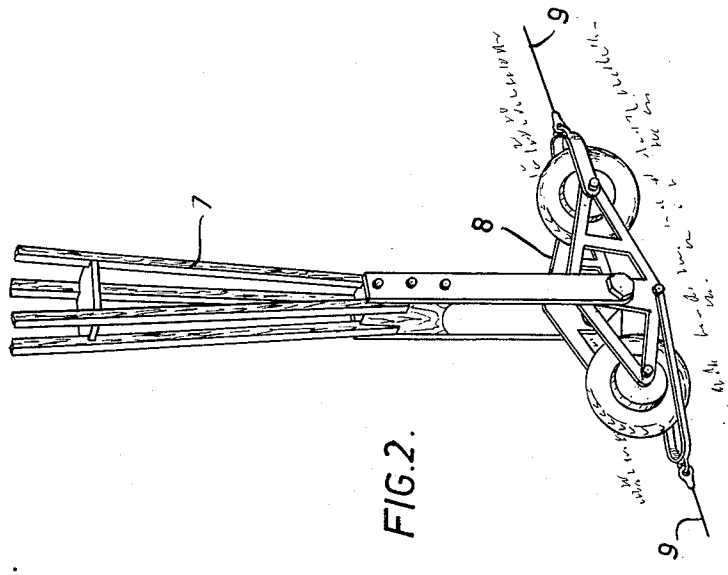


FIG. 2.

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RAISING DEVICE FOR AIRPLANE ARRESTING NETS

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The present invention relates to devices for preventing the runaway of airplanes in landing and more particularly to airplane arresting nets comprising an upper framing wire and a lower framing wire extending substantially horizontally between a pair of tiltable masts for keeping the net suspended in a substantially vertical plane, and vertical connecting ropes between said upper and lower wires.

The object of the invention is to provide means for facilitating the raising and lowering of nets of the said kind, when they are of such dimensions as to require an auxiliary supporting mast or masts provided at a suitable point or points between the masts at the ends of the net, hereinafter referred to as main supporting masts.

Hitherto the operation of such auxiliary masts have proved very difficult, which might have been the reason why such masts have not yet been commonly used in connection with airplane arresting nets of such dimensions as to render the use of auxiliary masts justified.

The invention provides a practical solution of the problem of controlling the auxiliary masts.

A feature of the invention involves that the auxiliary mast or each of them, if there are more than one, is pivotally connected to the upper framing wire of the net by its top end, while the bottom end of the auxiliary mast or each of them is resting on the ground and so connected to means for controlling the raising and lowering of the net by displacing the auxiliary masts in the longitudinal direction of the lower framing wire of the net.

The above and other features of the invention will appear from the detailed description of a preferred embodiment of the invention hereinafter to follow, reference being had to the accompanying drawings, in which:

FIG. 1 is a front elevation of an airplane arresting net in its raised position;

FIG. 2 is a perspective view of the bottom end of an auxiliary mast; and

FIGS. 3 and 4 are front elevations of means for controlling the raising and elevation of an arresting net.

The net 1 shown in FIG. 1 in its raised position ready for arresting a landing airplane, is held suspended in a substantially vertical plane between two main supporting masts 2 of a preferably tiltable type, by means of an upper framing wire 3 and a lower framing wire 4. Except said framing wires the net includes a set of connecting ropes 5 extending in the position shown vertically between the upper and lower framing wires. The framing wires are connected at each end of the net to a braking mechanism 6 which may, preferably, be of the drum type. At inner points of the net are shown two auxiliary supporting masts 7, pivotally connected by their top ends to the upper framing wire 3 of the net and pivoted by their bottom ends to carriages 8 movable on the ground along a path parallel with the lower net framing wire. The main supporting masts may be of wellknown structure capable of resisting the stresses to which they may be subjected. The auxiliary masts are, preferably, made of wood and of a sufficient strength for performing their net supporting action, yet fragile enough not to essentially damage an airplane wing colliding therewith.

In the example of an auxiliary mast shown in FIG. 2 the carriage 8 is of a bicycle-like structure. It is to be noted, however, that the means for supporting the auxiliary mast may comprise, for instance, a single wheel, a slide shoe or another means allowing a displacement of the bottom end of the mast along a given path on the ground. In the example of carriage 8 shown in FIG. 2 the bottom end of the auxiliary mast 7 is forked so as not to come into collision with the tandem wheels or the frame structure connecting them. The carriage 8 shown in FIG. 2 is driven by a wire or rope transmission 9 from an electric motor shown at 10 in FIG. 3.

FIG. 3 illustrates in a diagrammatic manner the mechanism for controlling the raising of an auxiliary mast. In FIG. 3 the numeral 3 designates the upper framing or suspending wire of the net not other wise shown, 7 is the auxiliary mast pivotally connected at its top end to the wire 3 and at its bottom end to a carriage 8. The wire or rope 9 connected to the frame of carriage 8 is passed round a pulley 11 and connected by its ends to a drum 12 driven by the motor 10 on which the wire or rope 9 is wound in such a way that the part connected to the carriage 8 and the part returning to the drum 12 move in opposite directions upon a rotation of the drum. The pulley 11 is freely rotatable on a pivot pin which may be displaced in the direction towards the drum 12 against the action of a spring 13, which serves to hold both parts of the wire or rope 9 stretched but allows the pulley 11 to move in the direction towards the drum 12, should the carriage during the raising operation for some reason be temporarily brought to a standstill, while the motor 10 and drum 12 are still in operation. The slack thus appearing in the wire or rope portion extending between the carriage and the drum may be taken up by the expansion of a spring 14 inserted in said portion.

FIG. 4 illustrates an embodiment of a device in which the main supporting mast at one end of the net and an auxiliary mast are controlled by one and the same electric motor. A similar arrangement may be used in respect of the other end of the net.

In FIG. 4 the net is indicated by its upper framing wire 3 and some vertical connecting ropes 5. The main mast is indicated at 2, the auxiliary mast at 7, its supporting carriage at 8 and the transmission wire or rope for moving same at 9. In this case the electric motor 10 is connected by its shaft to a drum 15 on which a wire or rope 16 for raising the main mast is wound. The drum 15 is connected on its side remote from the motor by means of a gearing 17 and a clutch 18 to the shaft of a drum 19 on which the part of the transmission wire or rope 9 extending from the pulley 11 is wound. The part of the transmission wire or rope 9 extending directly from the carriage 8 is wound on a separate drum 20 mounted on the shaft of drum 19. Associated with drum 19 is a spring device enclosed in a casing 21 which is designed constantly to keep the respective part of the transmission wire or rope under a tension sufficient to prevent slacking of this part of the transmission wire or rope.

The clutch is controlled by means, not shown, in such a way as to be held disengaged during the initial period of the raising operation, during which the raising of the main mast is effected, and is engaged during the remaining period of the raising operation, to effect the raising of the auxiliary mast. During the lowering operation the clutch 18 is disengaged after the auxiliary mast has reached its horizontal position so as thereby to disconnect the auxiliary mast from the main mast. The spring in housing 21 is provided with a stop acting to render the spring inoperative upon reversal of the direction of rotation, that is to say, during the net lowering operation.

In the embodiment shown in FIG. 4 the pulley 11 is disposed within a tubular casing 22 having relatively small apertures for the passage of the operating wire or rope 9. The casing 22 serves to prevent the supporting wires

of the arresting net from entangling themselves with the pulley 11. The latter, in its turn, is mounted by means of a fork on the extreme end of a wire 23 wound on a drum 24 having combined therewith a spring device 25 like that of drum 20 and for a similar purpose.

In the operation of the net raising device the main supporting masts 2 are first raised to approximately ⅔ of their full angle of elevation at which moment the lifting of the points of wire 3 where the auxiliary masts are attached begins. In this position the clutches 8 are engaged with the result that the carriages of the auxiliary masts begin to move towards the middle of the net as indicated by arrows in FIG. 4. If now, due, for instance, to the tilt of an auxiliary mast being still too small with relation to the horizontal, the thrust exerted on this mast should be excessive without resulting in any appreciable lift exerted on the top supporting wire 3 of the net, then the spring (as 13 or 24) acting on the pulley 11 will yield thereby allowing the auxiliary mast to be still standing for a short moment during the raising operation. The rates of movement of the main and auxiliary masts are so interrelated as to allow both of them to attain their fully raised position simultaneously.

Although the present invention is primarily intended for use in conjunction with airplane arresting apparatus, the invention may find other applications as well, where it is desired to provide for automatically elevating and lowering horizontal wires or cables and where the requirement for a rapid rate of elevation is sufficiently important to call for the application of such a direct lifting method.

We claim:

1. A device of the class specified comprising in combination an arresting net including upper and lower substantially horizontal framing wires and a plurality of vertical connecting ropes therebetween, two tiltable main supporting masts for the net, means including said upper framing wire for keeping the net suspended in a substantially vertical plane between said main masts, an auxiliary mast at least for supporting an inner point of the net, said auxiliary mast being pivotally connected at its top end to the upper framing wire of the net at said point, means displaceable on the ground in the longitudinal direction of the net for supporting said auxiliary mast, the auxiliary mast being pivotally connected at its bottom end to said supporting means, and means for effecting the displacement of said supporting means for the purpose of raising or lowering the auxiliary mast.

2. A device of the class specified comprising in combination, an arresting net including upper and lower substantially horizontal framing wires and a plurality of vertical connecting ropes therebetween, two tiltable main supporting masts for the net, means including said upper framing wire for keeping the net suspended in a substantially vertical plane between said main mast, an auxiliary mast at least for supporting the net at an inner point thereof, said auxiliary mast being pivotally connected to a point of the upper framing wire of the net, a carriage movable on the ground for supporting said auxiliary mast, a pivotal connection between the bottom end of said mast and said carriage, means for controlling the raising and lowering of the main mast, means for moving said carriage in the longitudinal direction of the net for effecting raising and lowering of the auxiliary mast, and a common electric motor for controlling the operation of said means.

3. A device as claimed in claim 2, in which the means for controlling the raising and lowering of the main masts are connectable to and disconnectable from the means for controlling the movement of the auxiliary mast supporting carriage by means of a clutch adapted during the raising operation to throw the means for raising of the auxiliary mast into action subsequent to the commencement of the raising of the main mast and during the lowering operation, to disconnect the carriage moving means from the means for controlling the lowering of the main mast after the auxiliary mast has reached its fully lowered state.

4. A device of the class specified comprising in combination an arresting net including upper and lower substantially horizontal framing wires and a plurality of vertical connecting ropes therebetween, two tiltable main supporting masts for the net, means including said upper framing wire for keeping the net suspended in a substantially vertical plane between said main masts, an auxiliary mast at least for supporting an inner point of the net, said auxiliary mast being pivotally connected at its top end to the upper framing wire of the net at said point, a carriage movable on the ground in the longitudinal direction of the net for supporting the auxiliary mast, the auxiliary mast being pivotally connected at its bottom end to said carriage, a wire transmission extending in the longitudinal direction of the net for moving said carriage, said transmission wire being passed by its one end remote from the carriage around a power driven drum and by its other end remote from the carriage around a pulley loosely mounted on a pivot displaceable to a given extent in the direction towards the carriage against the action of a spring.

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