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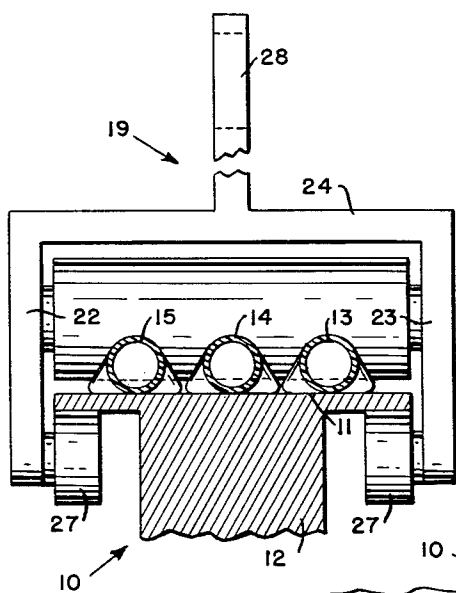


FIG. 2

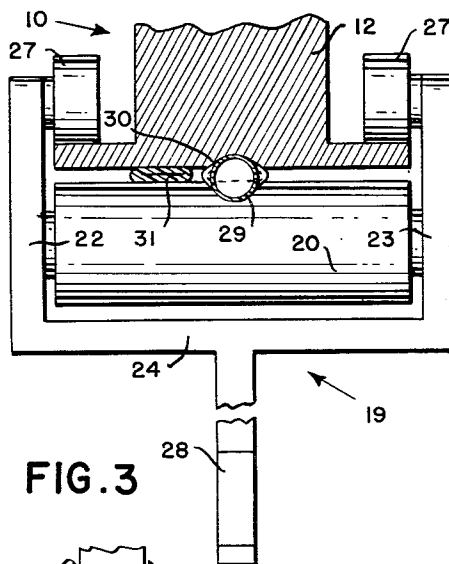


FIG. 3

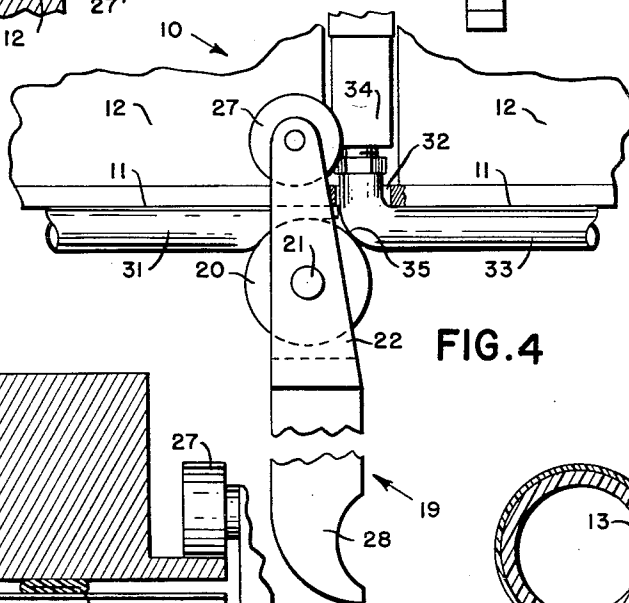


FIG. 4

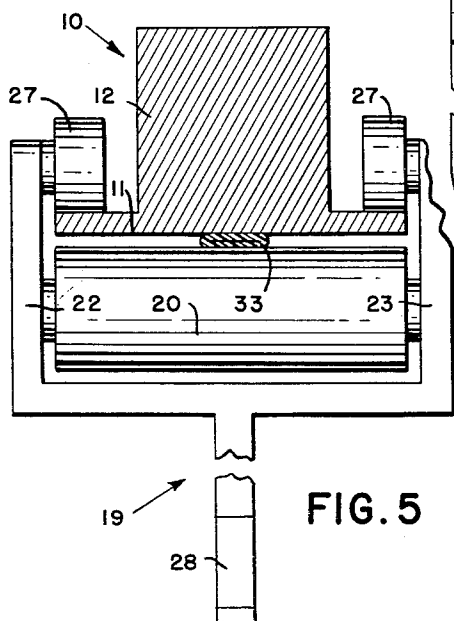


FIG. 5

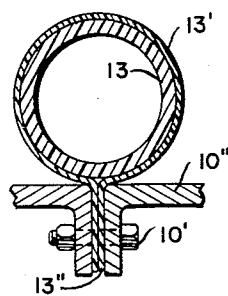


FIG. 1A

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The present invention relates to airplane launching devices, and particularly to a new and improved flexible tube, fluid pressure launching device in which a carriage having a presser means capable of locally flattening or reducing the cross-sectional area of a flexible tube is propelled along the tube by the action of pressure fluid within the tube.

While the principles of the invention are applicable to any type of airplane launching device, they will be shown and described as applied to an airplane carrier launching device.

The principal object of this invention is to provide an airplane launching device in which pressure fluid within a flexible, collapsible hose means acts on presser roller means in a manner to propel a carriage along the launching deck of an aircraft carrier, an airport landing strip or the like. Pressure fluid may include air, gas, steam or liquid.

Another object of this invention is to provide such a launching device in which the collapsing action of the presser roller is related to the pressure of the fluid within the flexible, collapsible hose.

Another object of the invention is to provide such a launching device in which separate flexible, collapsible hose means are arranged in line in a manner to successively act on a launching carriage to effect its desired acceleration along a launching deck portion or strip, deceleration along a decelerating portion, and return to the beginning of the launching deck or strip portion.

Another object of this invention is to provide such an airplane launching device that can be made substantially automatic in its operation so that upon the launching of a plane, the launching carriages are automatically advanced to their next succeeding stations along the separate hose means.

In one aspect of the invention, a horizontal, upwardly facing launching track portion may be provided with continuous passages along each edge thereof for the reception of portions of a launching carriage mechanism. This track portion may be supported by a central, longitudinally disposed flange extending from the underside of the track and which may be fixed in any appropriate manner to the internal girder construction of the vessel. At the launching end of the flight deck, the track portion may curve downwardly below the flight deck and return with its horizontal track portion facing downwardly and lying in a plane parallel, or otherwise disposed relatively to the flight deck. This below deck track portion may extend to a location beneath a loading portion of the flight deck, where it may curve upwardly to the flight deck and extend therealong, following any desired path to the launching station.

In another aspect of the invention, one or more flexible, collapsible hose means may extend longitudinally along the launching portion of the track. This hose means may be open to the atmosphere at the launching end of the launching deck if the fluid employed is expansible, or open to a chamber providing substantially no back pressure within the hose means if the fluid employed is non-expansible. The other end of the hose may be connected to manifold means in a manner to supply fluid under pressure to the interior of the hose means.

A carriage may be mounted on the track and it may include presser means which may take the form of a roll

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journaled on a shaft extending between pendants that are spaced apart an amount greater than the width of the track so that with the roll on the collapsed hose means, they may pass freely into passages on each side of the track. Separate roller means may be journaled on stub shafts on each side of the track flange, and the axes of which stub shafts may be coextensive and parallel with the axle on which the presser roll is journaled. The construction may be such that the separate roller means contact the undersurface of the launching track with the presser roll in position effecting the substantially complete collapse of the flexible, collapsible hose means. The pendants supporting the roll means may be provided with hook means for releasable engagement with an aircraft.

In another aspect of the invention, the open-ended hose means may stop short of the end of the launching deck so that the carriage may encounter the beginning of a carriage decelerating means which may take the form of a flexible hose means closed at both ends and containing a fluid. This hose means may extend along the track as it curves downwardly beneath the launching deck. The action of the presser roll of the carriage forcing the fluid from its leading to its trailing side decelerates the carriage. In combination with the decelerating means, a flexible, collapsible hose means may be provided that may act on the carriage in the same way as the launching hose means acts on it, but in a manner to propel the carriage at a relatively slow rate of travel after it has decelerated to a predetermined speed.

At the end of the decelerating portion of the track, the carriage may be transferred onto another flexible, collapsible hose means that may act on it similarly to the action of the launching hose means, but again in a manner to propel the carriage at a relatively slow rate along the remaining track beneath the flight deck, thence upwardly to the flight deck and back to the point of beginning.

The above as well as other objects and novel features of the invention will become apparent from the following specification and accompanying drawings which are merely exemplary.

In the drawings:

FIG. 1 is a schematic perspective line diagram of a system to which the principles of the invention have been applied;

FIG. 1A is a fragmentary sectional view of a means for anchoring the hose to the surface.

FIG. 2 is a sectional elevational view taken substantially along line 2—2 of FIG. 1;

FIG. 3 is a sectional elevational view taken substantially along line 3—3 of FIG. 1;

FIG. 4 is an elevational view taken substantially along line 4—4 of FIG. 1;

FIG. 5 is a sectional elevational view taken substantially along line 5—5 of FIG. 1;

FIG. 6 is an elevational view taken substantially along line 6—6 of FIG. 1; and

FIG. 7 is a plan view taken along line 7—7 of FIG. 6.

Referring to the drawings, and particularly to FIG. 1, the principles of the invention are shown as applied to an aircraft carrier vessel although they may with equal facility be applied to a ground installation as well. In FIG. 1, a supporting member 10 may take the form of a beam of T-section or the like including a horizontally disposed plane surface 11 and a centrally disposed vertical flange member 12. The surface 11 may be located flush with or slightly below a deck portion D of an aircraft carrier or launching platform.

The supporting member 10 may be disposed longitudinally of the flight deck of the carrier and flush with

said deck or slightly therebelow. Adjacent the launching end of the flight deck, the supporting member may curve downwardly below the flight deck and pass therebeneath to a location near the rear of the carrier where it may curve upwardly to the flight deck and follow any desired path therealong to the beginning of the launching platform or launching section of the carrier.

One or more flexible, collapsible hose sections may be positioned on that portion of surface 11 that lies along the launching deck, and in the embodiment disclosed, three hose sections 13, 14 and 15 are arranged in spaced parallel relation and extend from the beginning of the launching deck to the launching end thereof.

Referring to FIGS. 6 and 7, the supporting member 10 is provided with an opening 16 between its side walls, and a portion of the flange 12 is omitted to accommodate a pressure fluid supply manifold 17 having three outlets 18 to each of which one end of one of the hose means 13, 14 and 15 is connected. The hose means passes upwardly through the opening 16 and curves leftwardly, lying along the surface 11 of the supporting member 10. The construction of the hose means may be such that it remains in a collapsed condition but will expand to an expanded condition, which may be cylindrical or less than cylindrical, when it is internally subjected to pressure fluid. The hose means may be made up of a fabric-embedded rubber material and may comprise a natural or synthetic rubber or other suitable flexible and resilient material, preferably having at least one layer of fabric cord or the like embedded therein. The flexible and resilient material hose means also may be of braided metal construction or other types of metal hose, and the term "flexible" is meant to include such herein.

The hose means may be anchored to the surface 11 of the supporting member 10 by any suitable means such as a narrow strip of adhesive, vulcanizing or mechanical means. A mechanical means may comprise a sheet of tough, reinforced fabric or flexible material 13' wrapped around the hose means 13 as shown in FIG. 1a. The free ends of the flexible material may form a tab 13'' that may be rigidly clamped between two angles 16' and 19' which may take the place of the supporting member 10. This construction would provide additional reinforcement to the hose means 13 and extend its life materially.

A carriage 19 may be provided for cooperation with the hose means 13, 14 and 15, and it may include a presser roll 20 having a longitudinal dimension that will be substantially equal to the transverse dimension of the surface 11 of supporting member 10. The diameter of the presser roll 20 is not critical and in the embodiment disclosed is shown as being substantially twice the diameter of the hose means.

A shaft 21 may extend through the presser roll 20, and it may repose in bearings within spaced parallel legs 22 and 23 of a yoke member 24. The legs 22 and 23 are spaced sufficiently to clear the supporting member 10, and the lower ends of said legs extend into clearance channels 25 and 26 (FIG. 7) between the supporting member 10 and the launching deck of the vessel.

At the lower end of each of legs 22 and 23, a separate roll 27 is journaled on a coextensive axis parallel to shaft 21. The axis of rolls 27 is spaced from shaft 21 an amount so that each roll 27 acts on the undersurface of member 10 on each side of the flange 12 thereof in a manner to cause presser roll 20 to substantially completely collapse the hose means 13, 14 and 15. The construction is such that the yoke 24 and rolls 20 and 27 act as a freely floating carriage 19 that can rock to a limited degree about the axis of rolls 27 when the flexible hose means is inflated between the carriage 19 and the manifold 17 (FIG. 1).

The yoke 24 may be provided with a hook member 28 extending upwardly therefrom and adapted to engage a member on an aircraft for imparting to the aircraft the

speed at which the carriage 19 is propelled along the supporting member 10.

The ends of the hose means 13, 14 and 15 at the launching end of the vessel are open to the atmosphere so that there is no restriction to the propelling force applied to carriage 19 by the inflation of the collapsible hose means behind it. However, in order to separate the hook member 28 from the aircraft and to decelerate the carriage 19, a hose member 29 (FIGS. 1 and 3) may be supported by the supporting member 10 along its surface 11 as the latter curves downwardly beneath the flight deck. The hose member 29 may be similar to hose means 13, 14 and 15, but it is closed at both ends and contains a fluid therein at least partially expanding the same. The construction and arrangement of the hose member 29 and the surface 11 are such that presser roll 20 does not completely collapse it but permits transfer of the fluid within the hose member 29 from one side of the carriage 19 to the other as the carriage moves along it. The rate of transfer of the fluid determines the braking action on the carriage 19. While the hose member 29 may be fastened to the surface 11 of the supporting member 10, it is shown as being partially received within a depression 30 within the surface 11 to facilitate its intended action of decelerating the carriage 19 as the latter leaves the flight deck of the vessel and passes toward a carriage return portion of the supporting member 10.

While a degree of flexibility is present in the above described decelerating mechanism, it may be desirable to provide additional means to move the carriage 19 to the carriage return portion of the member 10 after it has been decelerated to a proper speed. Accordingly, a hose member 31 (FIGS. 1 and 3) may extend along surface 11 in parallel relation with hose member 29 for a predetermined distance. It may have its end nearest the launching deck of the vessel continuously supplied with pressure fluid by a manifold means similar to 17 (FIG. 6) and its end adjacent the beginning of the carriage return portion of member 10 may be open to the atmosphere if the fluid employed is expansible, or open to a chamber providing substantially no back pressure in the hose member 29 if the fluid employed is non-expansible. Furthermore, its construction and arrangement may be such that a relatively small propelling force is applied to the carriage 19 compared with the propelling force applied to the carriage by hose means 13, 14 and 15.

Referring to FIG. 4, the supporting member 10 may be provided with an opening 32 therein similar to the opening 16, and through which a hose member 33 may pass. The one end of hose member 33 may be fixed to the outlet of a pressure fluid manifold 34 in the same way that hose means 13, 14 and 15 are connected to manifold 17.

The open end of hose 31 is at such a point relatively to the portion of hose 33 that extends outwardly from manifold 34 that presser roll 20 will abut the curved portion 35 of hose 33 when the latter is inflated and at the same time maintain the open end of hose member 31 collapsed so that a force is always exerted on the carriage 19 forcing it against the curved portion 35 of hose member 33. The hose member 33 is similar to hose member 31, and its design and construction are such as to cooperate with the surface 11 and the presser roll 20 to effect the movement of carriage 19 along the hose member 33 at a taxiing rate of movement. The hose member 33 may extend continuously throughout the remaining length of the supporting member 10 back to the beginning of the launching section of the flight deck of the vessel. This hose member 33 may have its end adjacent the beginning of the hose means 13, 14 and 15 open to the atmosphere. Accordingly, when a carriage 19 is transferred onto the hose means 13, 14 and 15, the hose member 33 exhausts and a carriage 19 at the beginning thereof is forced over the now collapsed portion 35 into cooperating position with hose member 33 so that the

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pressure fluid from manifold 34 acts on it to move the carriage 19 along the return portion of the supporting member 10.

In the drawings, the movement of a carriage 19 from one of the hose means 13, 14, 15, 31 and 33 causes the corresponding exhausting of that hose means so that a following carriage 19 may be forced into cooperation with the next succeeding hose means. It is within the scope of this invention to provide manually or automatically controlled valve means for supplying pressure fluid to the various open ended hose means.

Additionally, although a single continuous hose 33 is provided for transporting the carriages 19 from their decelerated position to the beginning of the launching deck of the vessel, if desired, any number of in line, individual pressurized hose means similar to hose 33 having separate supply inlets may be substituted for the hose means 33 so that a plurality of carriages 19 may be in the process of being advanced from the decelerated position to the beginning of the launching section of the vessel, instead of a single carriage 19 as would be the case in the disclosed embodiment.

From the foregoing it is evident that the carriages 19 act as freely floating bodies that are caused to tilt in the direction of travel of the carriages. Accordingly, the pressing action of the rollers 20 on the collapsible hose means tends to become more effective as the pressure of the fluid within the hose means increases.

Although the various features of the new and improved launching device have been shown and described in detail to fully disclose one embodiment of the invention, it will be evident that numerous changes may be made in such details, and certain features may be used without others without departing from the principles of the invention.

What is claimed is:

1. In an aircraft launching device, a supporting member forming a continuous path from the beginning of a launching section through a decelerating section and a return section to the point of beginning; separate, in line, flexible, collapsible hose means extending throughout the length of said sections; means for supplying pressure fluid to the one end of said hose means at the beginning of each of said sections while exhausting the opposite ends thereof; a carriage having a presser roll adapted to lie transversely over said hose means; means on said carriage for cooperating with said supporting means to cause said presser roll to substantially completely collapse said hose means at the location along said hose means where said carriage is located; and means on said carriage for releasably engaging an aircraft.

2. In an aircraft launching device, supporting means forming a continuous path from the beginning of a launching section through a decelerating section and a return section to the point of beginning; separate, in line, flexible, collapsible hose means extending throughout the length of, and located on the outer side of said sections; manifold supply means on the side of said supporting means opposite the side thereof that supports said hose means; means for passing the inlet ends of said hose means through said supporting means and for connecting them to said manifold means, whereby the exhaust end of a preceding hose means is adjacent the inlet end of a succeeding in line hose means at the point where the latter passes through said supporting means; a carriage having a presser roll adapted to lie transversely over said hose means; means on said carriage for cooperating with said supporting means to cause said presser roll to substantially completely collapse said hose means at the location along said hose means where said carriage is located; and means on said carriage for releasably engaging an aircraft.

3. In an aircraft launching device, a supporting member forming a continuous path from the beginning of a launching section, through a decelerating section and a return section to the point of beginning; separate, in line, flexible, collapsible hose means extending substantially

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throughout the length of said sections; means for supplying pressure fluid to the one end of said hose means at the beginning of each of said sections while exhausting the opposite ends thereof; a carriage adapted to be propelled along said hose means; means on said carriage for effecting the collapse of said hose means at a point along said hose means where said carriage is located, the construction and arrangement of the parts being such that the force exerted on said carriage by said pressurized hose means increases the collapsing effect of said hose means at the point along said hose means where said carriage is located; and means on said carriage for releasably engaging an aircraft.

4. In an aircraft launching device, a supporting member forming a continuous path from the beginning of a launching section, through a decelerating section and a return section to the point of beginning; separate, in line, flexible, collapsible hose means extending substantially throughout the length of said sections; means for supplying pressure fluid to the one end of the hose means at the beginning of each of said sections while exhausting the opposite ends thereof; a carriage adapted to be propelled along said hose means; means on said carriage for effecting the collapse of said hose means at a point along said hose means where said carriage is located, said collapsing means including oscillatable means forming part of said carriage for journaling oppositely acting roller means for collapsing said hose means, whereby the force exerted on said carriage by said pressurized hose means produces a propelling force to said carriage and a tilting action to said oscillatable means in the direction of the exhausted end of said hose means; and means on said carriage for releasably engaging an aircraft.

5. In an aircraft launching device, a supporting member forming a continuous path from the beginning of a launching section, through a decelerating section and a return section to the point of beginning; separate, in line, flexible, collapsible hose means extending substantially throughout the length of said sections, the arrangement being such that the inlet of certain of said hose means is adjacent the exhaust end of a preceding hose means; means for supplying fluid under pressure to the inlet of each of said hose means while exhausting the opposite ends thereof; a carriage adapted to be propelled along said hose means; presser roller means on said carriage lying transversely of said hose means; and oscillatable means forming part of said carriage for journaling oppositely acting roller means for cooperation with said presser roller means for collapsing said hose means, whereby the force exerted on said carriage by said pressurized hose means produces a propelling force to said carriage and a tilting action to said oscillatable means in the direction of the exhausted end of said hose means and whereby the presser roller means abuts an inlet portion of a succeeding hose means while still preventing the exhausting of the exhaust end of a preceding hose means.

6. In an aircraft carrier vessel, an aircraft launching deck; a supporting member extending throughout the length of said launching deck, thence downwardly below the launching deck, thence along a path beneath the launching deck to a point rearwardly of said launching deck, thence upwardly to a loading platform and to the point of beginning; flexible, collapsible hose means fixed to said supporting member and extending substantially throughout the length of said launching deck; means for supplying fluid under pressure to one end of said hose means while exhausting the other end thereof; a carriage having a presser roll lying transversely of said hose means and adapted to be propelled along said supporting member by the pressure fluid within said hose; a flexible hose means closed at both ends and containing a fluid for decelerating said carriage, said closed ended hose means lying on said supporting member as it extends downwardly from the launching end of said launching deck; means for returning said carriage after it has been decelerated

to the beginning of said launching deck; and means on said carriage for releasably engaging an aircraft.

7. In an aircraft carrier vessel, an aircraft launching deck; a supporting member extending throughout the length of said launching deck, thence downwardly below the launching deck, thence along a path beneath the launching deck to a point rearwardly of said launching deck, thence upwardly to a loading platform and to the point of beginning; flexible, collapsible hose means fixed to said supporting member and extending substantially throughout the length of said launching deck; means for supplying fluid under pressure to one end of said hose means while exhausting the other end thereof; a carriage having a presser roll lying transversely of said hose means and adapted to be propelled along said supporting member by the pressure fluid within said hose; a flexible hose means closed at both ends and containing a fluid for decelerating said carriage, said closed ended hose means lying on said supporting member as it extends downwardly from the launching end of said launching deck; a flexible, collapsible hose means lying on said supporting member beside said closed ended hose means; means for supplying fluid under pressure to the end of said last mentioned hose means adjacent the launching end of said launching deck; means for returning said carriage after it has been decelerated to the beginning of said launching deck; and means on said carriage for releasably engaging an aircraft.

8. In an aircraft carrier vessel, an aircraft launching deck; a supporting member extending throughout the length of said launching deck, thence downwardly below the launching deck, thence along a path beneath the launching deck to a point rearwardly of said launching deck, thence upwardly to a loading platform and to the point of beginning; flexible, collapsible hose means fixed to said supporting member and extending substantially throughout the length of said launching deck; means for supplying fluid under pressure to one end of said hose means while exhausting the other end thereof; a carriage having a presser roll lying transversely of said hose means and adapted to be propelled along said supporting member by the pressure fluid within said hose means; decelerating means adjacent the launching end of said launching deck for decelerating said carriage; flexible, collapsible hose means fixed to said supporting member and extending from the end of said decelerating means to the beginning of said launching deck; means for supplying fluid under pressure to the end of said last mentioned hose means adjacent the end of said decelerating means while exhausting the other end thereof; and means on said carriage for releasably engaging an aircraft.

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