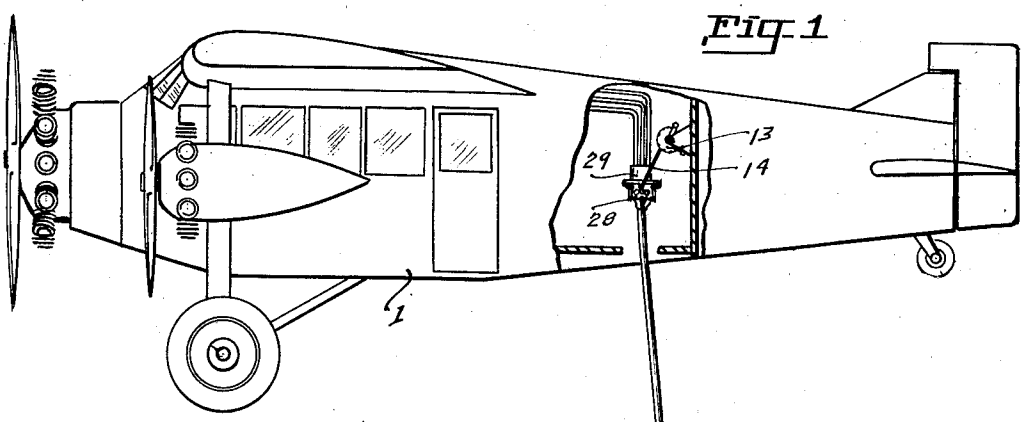
May 26, 1931. J. ULLENDORFF 1,806,834

MECHANISM FOR SUPPLYING FLUIDS FROM ONE AIRSHIP TO ANOTHER WHILE IN FLIGHT

Filed Sept. 25, 1929 4 Sheets-Sheet 1

Fig. 1



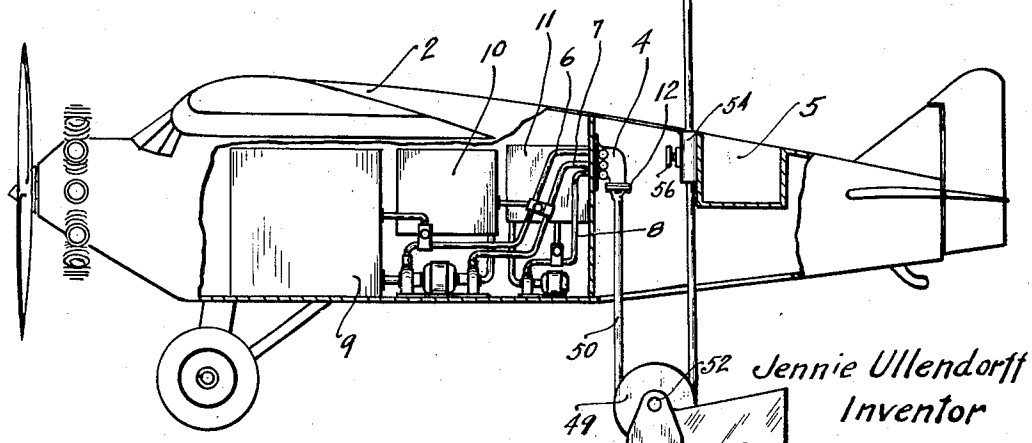


Fig. 2

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Fig. 4

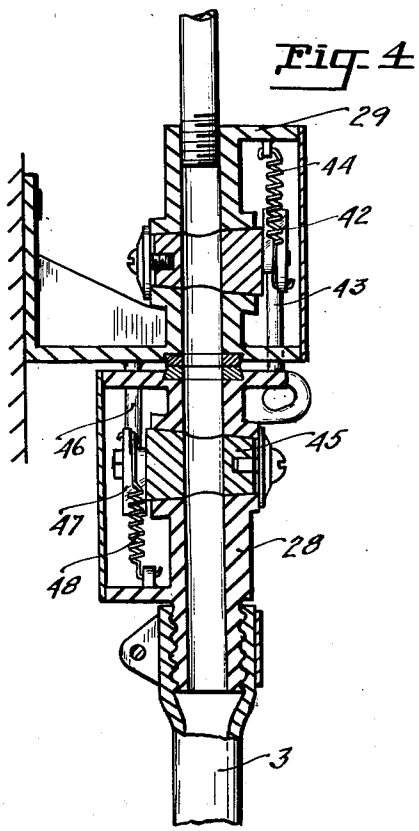


Fig. 3

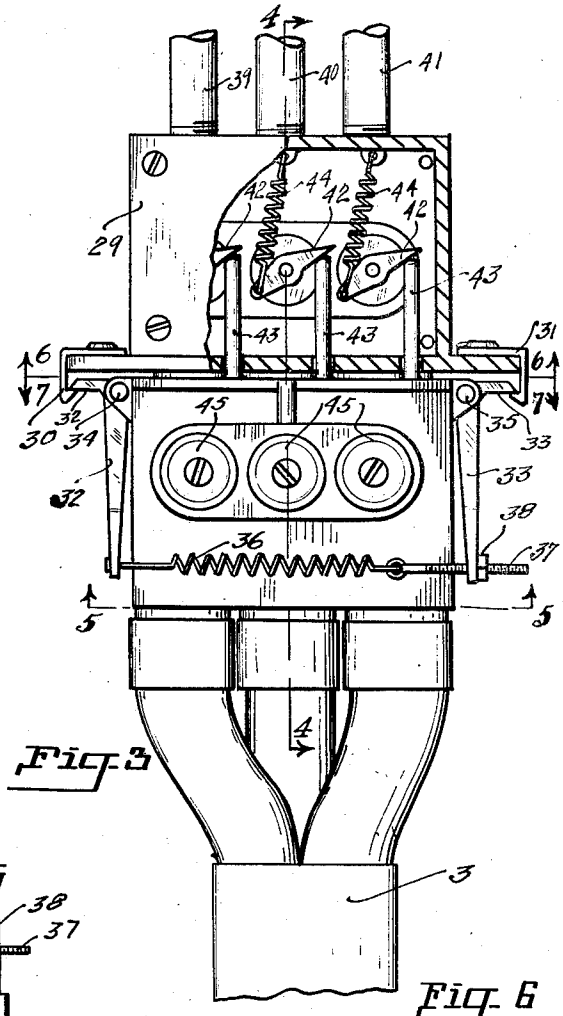


Fig. 5

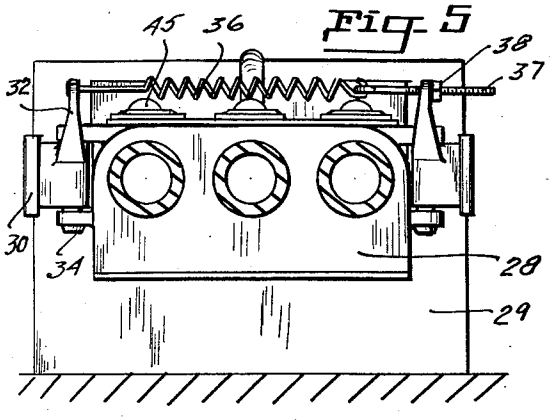


Fig. 6

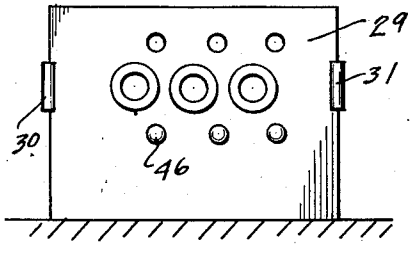
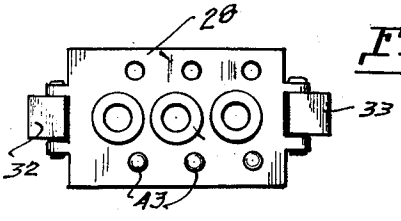


Fig. 7



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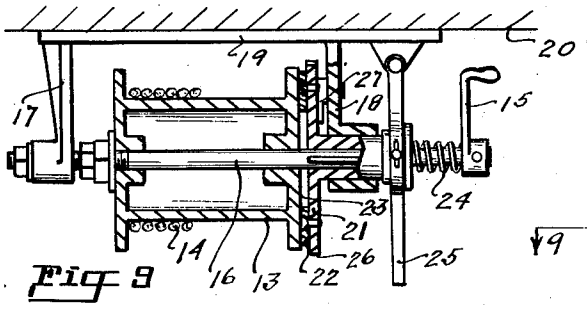
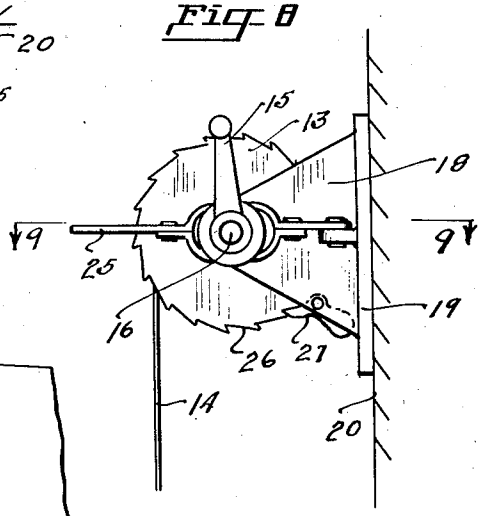


Fig. 9

Fig. 8



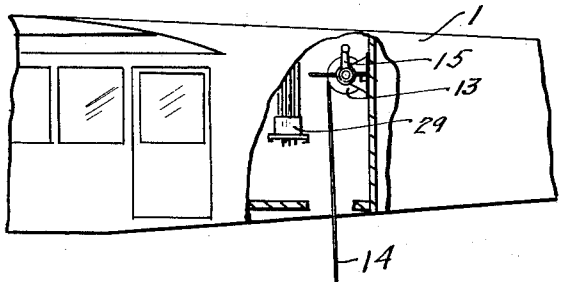


Fig. 11

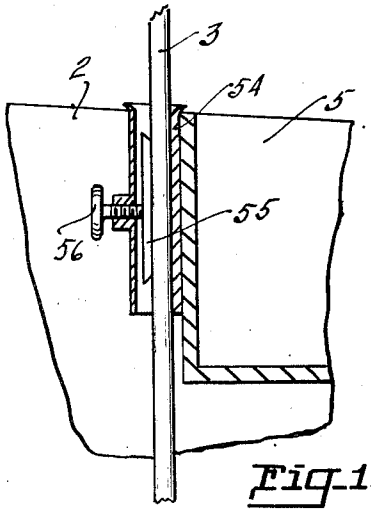


Fig. 10

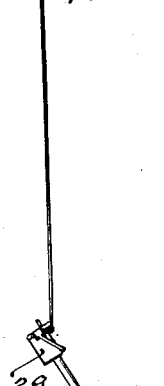
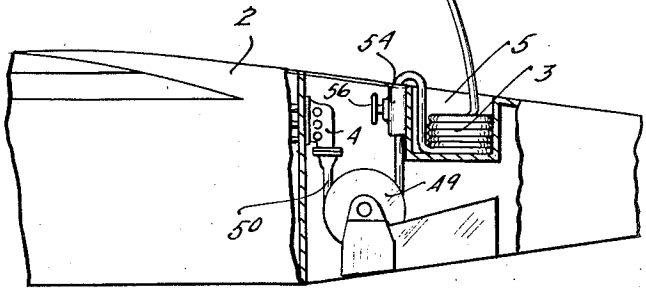


Fig. 12



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MECHANISM FOR SUPPLYING FLUIDS FROM ONE AIRSHIP TO ANOTHER WHILE IN FLIGHT

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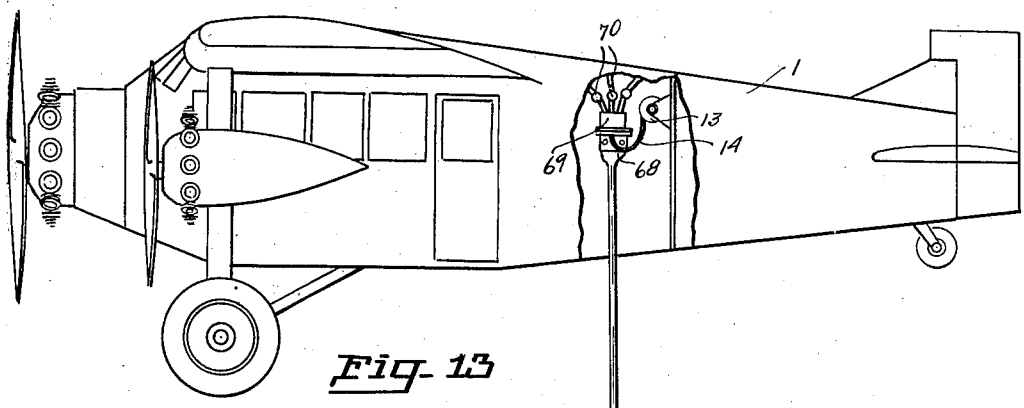

Fig. 13

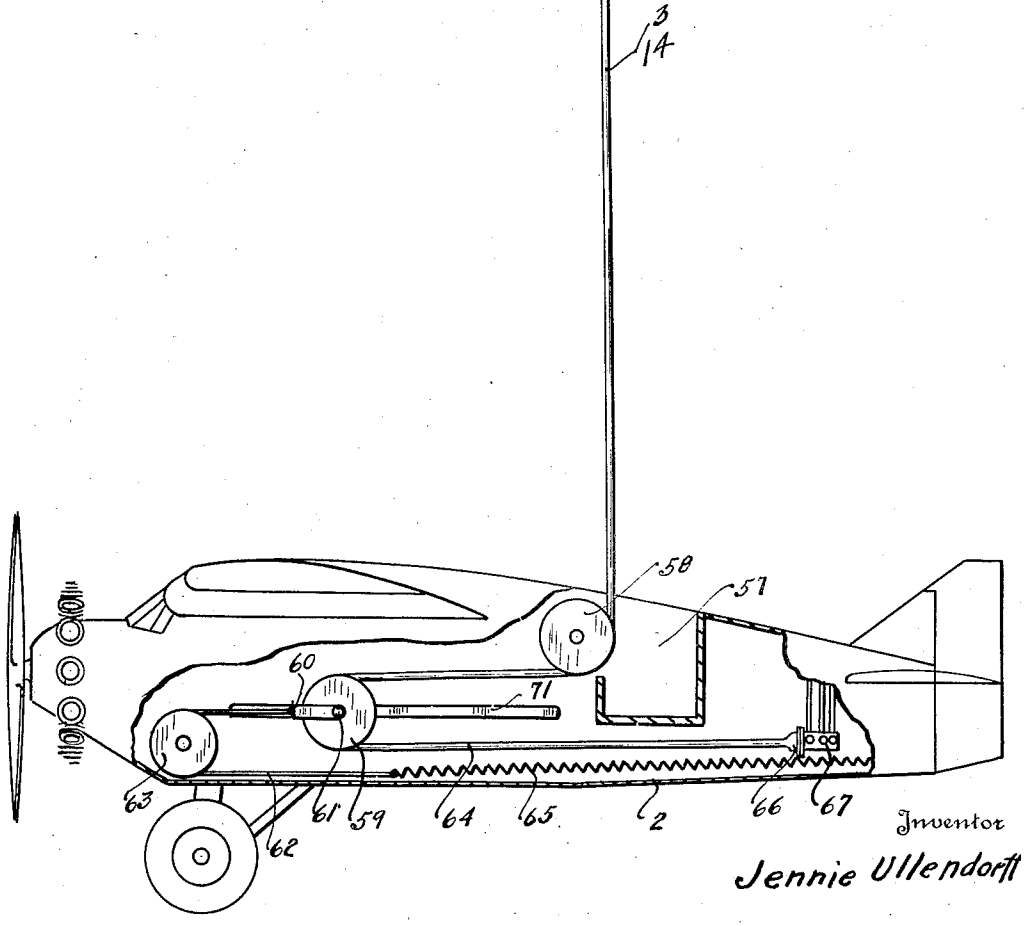

Fig. 14

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Patented May 26, 1931 1,806,834

UNITED STATES PATENT OFFICE

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MECHANISM FOR SUPPLYING FLUIDS FROM ONE AIRSHIP TO ANOTHER WHILE IN FLIGHT

Application filed September 25, 1929. Serial No. 395,079.

My present application relates to my pending United States patent application filed January 10, 1929, Serial Number 331,680 on a new and useful improvement in a mechanism for supplying fluids from one air ship to another while in flight.

The object of my present application is to refuel airplanes while in flight.

A further object of my present application is to simultaneously refuel, and to replenish the water and oil for the airplane simultaneously and at the same time to conduct the elements through a hose having a plurality of passageways disposed therethrough with a passage for each of the elements.

In my former application the mother ship was shown as being superposed the aided ship, while in my present application the mother ship is disposed at a lower altitude than that of the ship that is being supplied with the fluids.

A cable is disposed in the ship to be refueled and is let down by the unwinding of a drum until a connection is effected between the cable and the discharge end of the hose located upon the mother ship. When the cable is attached to the hose the cable is wound about a drum until the hose is brought up and the hose is connected to a manifold disposed within the ship to be aided. When the hose has been attached to the manifold, a motor is started for each fluid to be pumped. Each fluid is pumped independently and delivered through the manifold to the respective receiving tank for the fluid holding tank intended. Should one of the tanks become filled before the other of the tanks is filled, the fluid is bypassed and returned to the tank from which the same is being pumped. When all of the tanks are filled, the hose is disconnected from the manifold and is returned into the hose locker disposed within the mother ship. A counter weight is disposed upon a loop disposed within the hose for maintaining the hose in a taut condition while the refueling is in process. The counterweight maintains the hose in a taut condition at all times during the refueling operation.

Other objects of my invention is to refuel the ship being served from below, and thereby prevent oils and gas from being dissipated upon the ship being supplied with fuel and oil.

A further object of my invention is to reduce the time to a minimum that will be required in the servicing operation.

Further objects of my invention reside in mechanisms adapted to the completion of the service with all elements simultaneously.

Still further objects of my invention reside in simple elements adapted for maintaining the hose being used for the passage of fluids therethrough under tension at all times during the transfer of the fluids therethrough.

Still further objects of my invention consists in providing automatic means for the opening of the valves in the discharge end of the hose and in the manifold when the connection is made between the two and for automatically closing the valves when the connection is broken between the discharge head of the hose and the manifold.

With these and incidental objects in view, the invention consists in certain novel features of construction and combination of parts, the essential elements of which are set forth in the appended claims, and a preferred form of embodiment of which is hereinafter shown with reference to the drawings which accompany and form a part of this specification.

In the drawings:

Fig. 1 is a side view, partially in section, of the ship being served.

Fig. 2 is a side view, partially in section, of the mother ship. The transfer hose is illustrated as being connected between the mother ship and the ship being served.

Fig. 3 is a front view of the discharge head of the hose shown attached to the receiving head, disposed at the manifold of the receiving ship.

Fig. 4 is a side view, partially in section, of the mechanism illustrated in Fig. 3.

Fig. 5 is a cross section view of the discharge head disposed at the discharge end of the hose, the same being taken on line 5—5 of Fig. 3 looking in the direction indicated.

Fig. 6 is a cross section view, taken on

line 6—6 of Fig. 3 looking in the direction indicated.

Fig. 7 is a cross section view taken on line 7—7 of Fig. 3 looking in the direction indicated.

Fig. 8 is an end view of the reel which is used in the reeling in and out of the cable that is used for the raising and the lowering of the hose.

Fig. 9 is a cross section view taken on line 9—9 of Fig. 8 looking in the direction indicated.

Fig. 10 is a side view of the guide head disposed upon the mother ship and through which the hose is passed in the resupplying operation. A shoe is shown for maintaining the hose in a restricted operating condition.

Fig. 11 is a fragmentary, side view of the mother ship and of the receiving ship and illustrating the cable in operation for the raising or lowering of the hose.

Fig. 12 is a side view of the receiving ship shown partially in section and illustrating a modified form of inlet manifold and hose connection.

Figs. 13 and 14 are side views, partially in section, of the two ships, and illustrating the hose disposed between the two respective ships and connected to each. A modified form of element is disposed within the mother ship for maintaining the hose in a relatively taut condition while the connection exists between the respective ships.

Like reference characters refer to like parts throughout the several views.

1 is the ship to be serviced and 2 is the mother ship. A hose 3 is secured to a manifold 5 upon its one end and normally rests in the hose locker 5 of the mother ship. The manifold 4 of the mother ship has pipes 6, 7 and 8 leading from the manifold 4 to the respective tanks 9, 10 and 11 disposed within the mother ship. The tanks are for the purpose of carrying motor fuel, oil and water. Electric driven pumping units are disposed within each of the pipe lines disposed between the tanks and the manifold and are for pumping the elements from the tanks through the hose to the ship to be serviced.

The hose may be made with a plurality of passageways leading through the body element of the hose, or the transfer may be made through independent hoses, each of which is connected to the head 12 of the inlet end of the hose. When so made the respective hose units should be secured together. A reeling drum 13 is carried by the ship to be serviced and a cable 14 is wound about the drum. The drum may be power actuated, or manually actuated, and I have here shown a drum as being actuated by a hand crank lever 15. The crank 15 is secured to a shaft 16 that is journaled within suitable bearings disposed within the respective brackets 17 and 18 that are mounted upon the base 19. The base 19 is secured by any suitable fastening means to the supporting wall 20 of the carrying ship to which the same is attached. A friction hub 21 is fixedly positioned upon the shaft 16 and the drum 13 is disposed upon the shaft and is rotatably mounted thereupon. Friction elements 22 are fixedly positioned upon one face of the hub 21 engaging the face 23 of the drum 13. The frictional contact is developed by the engaging surfaces through the action of the compressible elements 24. A hand lever 25 is adapted to engage and disengage the engaging surface. It is desirable to have this frictional engagement to afford flexibility to the line or cable that connects the ship to be serviced with that of the mother ship.

A ratchet wheel 26 is disposed upon the outer surface of one end of the drum and a pawl 27 normally rides upon the toothed surface. When a connection is desired to be made between the ship to be serviced and the mother ship, the cable 14 is reeled downward until the same may be caught by the attendant of the mother ship, at which time the free end of the cable 14 is attached to the discharge end 28 of the hose 3. The hose 3 is then reeled in through the action of the winding drum until the discharge end of the hose 28 is connected to the manifold 29 that is disposed upon the ship to be serviced. Referring to Fig. 3 and to Fig. 4, the manifold 29 carries locking pawls 30 and 31. Engaging pawls 32 and 33 are carried by the discharge head of the hose and the respective pawls are in registerable alignment with each other. The pawls 32 and 33 are rockably disposed about supporting pins 34 and 35 and the arms of the engaging pawls 32 and 33 are connected together on their lower end by a tensioning spring 36. The tension upon the spring may be regulated by the action of the adjusting screw 37 and the desired tension is placed upon the spring 36 through the adjusting nut 38 that is threadably positioned along the adjusting screw 37. When the connection is completed between the manifold 29 and the discharge head 28 of the hose the locking elements are in registerable engagement with each other. Should an undue shock be placed upon the hose 3, the engaging head and manifold are disengaged from each other. A plurality of valves are carried within the inlet manifold and pipes 39, 40 and 41 lead from the manifold 29 to tanks disposed within the ship to be serviced and motor fuel, oil and water may be pumped through the respective pipes directly into the tanks of the receiving ship from the mother ship. A valve is disposed at the inlet end of each of the pipes and each valve stem carries an arm 42. Studs 43 are carried by the discharge head of the hose and are in registerable alignment with the arms 42 and as the connection is completed between the man-

ifold and the discharge head, the studs 43 manipulate the arms 42 and open the valves. Springs 44 normally maintain the valves in closed position. Valves 45 are also carried by the discharge head of the hose and studs are also carried by the manifold as illustrated at 46. The studs 46 are in registerable engagement with the operating levers 47 secured to the valves 45 and as the registerable engagement is completed between the manifold and the discharge head, the valves 45 are opened and are maintained open so long as a complete connection is maintained between the manifold and the discharge head. Springs 48 normally maintain the valves 45 closed when the connection is not completed. With the connection completed between the engaging elements, fluids may be pumped through the respective passageways disposed within the hose and be directly pumped from the tanks of the mother ship into the tanks of the receiving ship.

The hose 3 may be maintained in a relatively taut condition by the placing of a counterweight 49 within a loop 50 of the hose that downwardly extends from the under side of the fuselage of the mother ship. The counterweight 49 consists of a pulley that rides upon the hose. The pulley is shrouded by a yoke 51 that passes about the counterweighted pulley 49. A vane 53 rearwardly extends from the yoke and is for maintaining the counterweight in alignment with the stream line of the fuselage.

The hose passes through a guideway 54 disposed upon the mother ship, as illustrated in detail in Fig. 10 and an adjustable shoe 55 engages the hose. A frictional engagement is maintained between the guideway 54 and the shoe 55 by an adjusting screw 56. The adjusting screw 56 may be adjusted to maintain a proper working frictional engagement between the hose, the guideway and the shoe.

I have illustrated a modified form of construction in Figs. 13 and 14 for the handling of the hose and the maintaining of the same in a relatively taut condition. The hose locker is illustrated at 57 in Fig. 14 and the hose is trained about guide pulleys 58 and 59. A yoke 60 is connected to the pin 61 passing through the pulley 59 and a cable 62 passes about the pulley 63 and a constant pressure is applied to the pulley 60 and to the loop 64 of the hose by the relatively long tensioning element 65. The inlet end 66 of the hose is directly secured to the manifold 67 and the discharge head 68 of the hose is directly attachable to the inlet manifold 69. Check valves 70 are disposed in each of the pipes leading from the manifold 69 disposed within the ship to be serviced. A suitable guideway 71 is disposed within the fuselage for the maintaining of the pulley 59 in alignment and position.

While the form of mechanism herein shown and described is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to the one form of embodiment herein shown and described, as it is susceptible of embodiment in various forms, all coming within the scope of the claims which follow.

What I claim is:

1. In a device of the class described, the combination of a mother ship and a receiving ship, the receiving ship being superposed the mother ship, a hose detachably attachable from one to the other of the ships, means for pumping elements through the hose and means for maintaining the hose in a relatively taut condition during the transfer.

2. In a device of the class described, the combination of a mother ship and a receiving ship, the receiving ship being above the mother ship dispensing tanks disposed within the mother ship, a multi-tubular hose connected to the mother ship, intercommunicating conduits connecting the tanks with the hose, pumping units disposed within the conduits, receiving tanks disposed within the receiving ship, a receiving head disposed within the receiving ship, intercommunicating conduits connecting the tanks with the receiving head, means disposed upon the discharge end of the hose from one ship to the other, automatic means disposed upon the discharge end of the hose and upon the receiving head for preventing loss of the fluids upon the detaching of the hose, and means for maintaining the hose in a taut condition during the transfer of the fluids.

3. In a device of the class described, in combination with refueling apparatus disposed in a mother ship and a receiving ship, the receiving ship superposed the mother ship, a multi-tubular hose terminating in a discharge head, said head having as many passageways as there are conduits, valves disposed within said passageways, said valves each having an arm disposed thereon and tensioned to maintain the valves in a closed position, stud receiving openings disposed within the discharge head, adjustably tensioned engaging means, a receiving head, said head having passageways in registerable alignment with the passageways disposed within the discharge head, valves disposed within the receiving head passageways, said valves each having an arm disposed thereon and tensioned to maintain the valves in a closed position, stud receiving openings disposed within the receiving head, locking means in registerable alignment with the discharge head, engaging means disposed upon the head.

4. In a device of the class described, in combination with refueling apparatus disposed within a receiving ship superposed the mother ship, a receiving head divided into a plurality of passageways directly aligned

with conduits leading to the receiving tanks, a valve disposed within each passageway disposed within the receiving head, said valve adapted to normally remain closed, locking pawls disposed upon the peripheral lip, stud receiving openings disposed within the head, and a plurality of studs outwardly extending from the receiving head.

5. In a device of the class described, in combination with refueling apparatus disposed within a mother ship and a receiving ship, the receiving ship superposed the mother ship, a multi-tubular hose connected on its one end to the mother ship conduits and terminating in a discharge head at its free end, adjustably tensioned engaging means disposed upon the discharge head, fluid dispensing passageways disposed within the head, a valve disposed within each of said passageways, said valves adapted to normally remain closed, stud receiving openings disposed within the head, and a plurality of studs outwardly extending from the discharge head.

6. In a device of the class described, in combination with refueling apparatus disposed within a mother ship and a receiving ship, the receiving ship being superposed the mother ship, a multi-tubular hose terminating in a discharge head, said head having as many passageways as there are conduits, a receiving head disposed within the receiving ship and having a like number of passageways in registerable alignment with the passageways disposed within the discharge head, valves disposed within the passageways, disengagedly locking means disposed upon the discharge head and receiving head, and automatic means disposed within both heads for the opening of the valves when the heads are locked and for closing the valves when the connection is broken.

7. In a device of the class described, the combination in a receiving ship superposed the mother ship, fluid receiving tanks, a receiving head secured to the receiving ship, intercommunicating conduits between the receiving tanks and the receiving head, engaging means disposed upon the receiving head, and automatically operable valves disposed within the receiving head.

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