United States Patent [19]

Thompson, deceased et al.

[11] **3,893,538**

[45] **July 8, 1975**

[54] **GROUND EFFECTS VEHICLE AND AN AIR TERMINAL**

[76] Inventors: **J. Dale Thompson, deceased,** late of Seattle, Wash.; **Dorothy B. Thompson, executrix,** 3265 41st. Southwest, Seattle, Wash. 98116

[22] Filed: **Aug. 10, 1970**

[21] Appl. No.: **62,307**

[52] **U.S. Cl.** ..... **180/117;** 180/119; 244/50; 244/114; 180/118; 104/23 FS

[51] **Int. Cl.** **B60v 1/04;** B60v 3/00

[58] **Field of Search** ..... 180/116–121; 214/85; 244/114, 5 D; 14/71, 72; 104/23 FS

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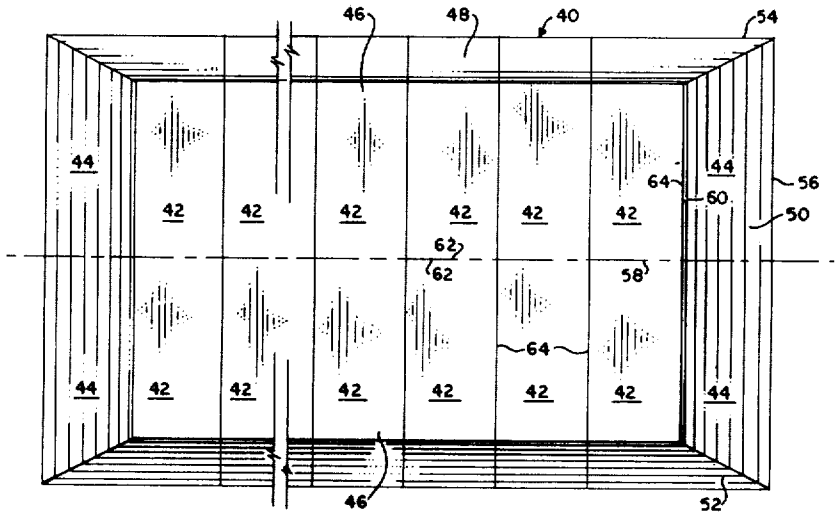
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Primary Examiner—Kenneth H. Betts

[57] **ABSTRACT**

This invention is directed to a ground effects vehicle capable of resting on and moving on a cushion of gas such as air or nitrogen or other suitable gases. This ground effects vehicle is capable of moving and maneuvering heavy objects over a relatively smooth terrain such as concrete and asphalt and, also, over an unfriendly terrain such as a rough terrain like earth and terrains with a low load-carrying capability such as soft ground, a marsh, snow and relatively thin concrete.

103 Claims, 34 Drawing Figures



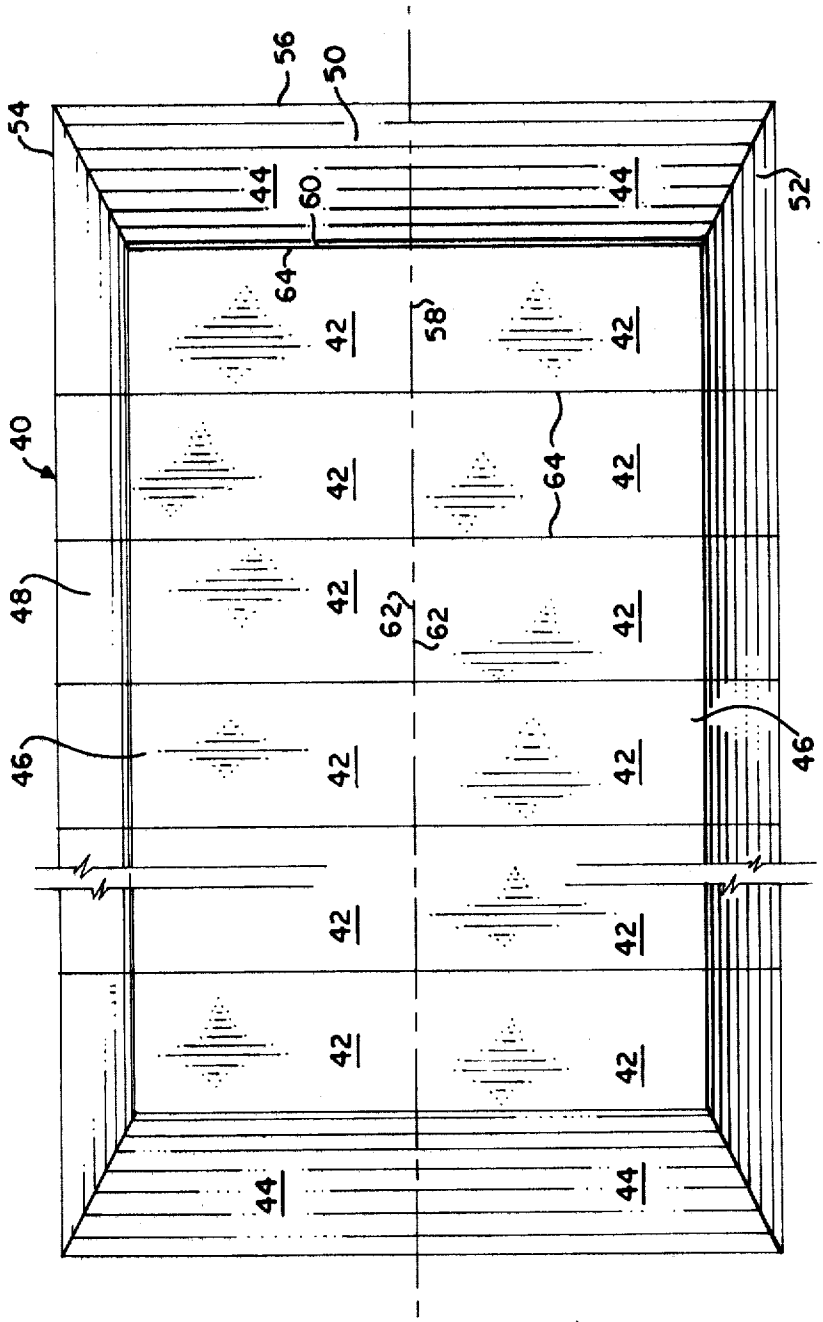

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FIG. 1

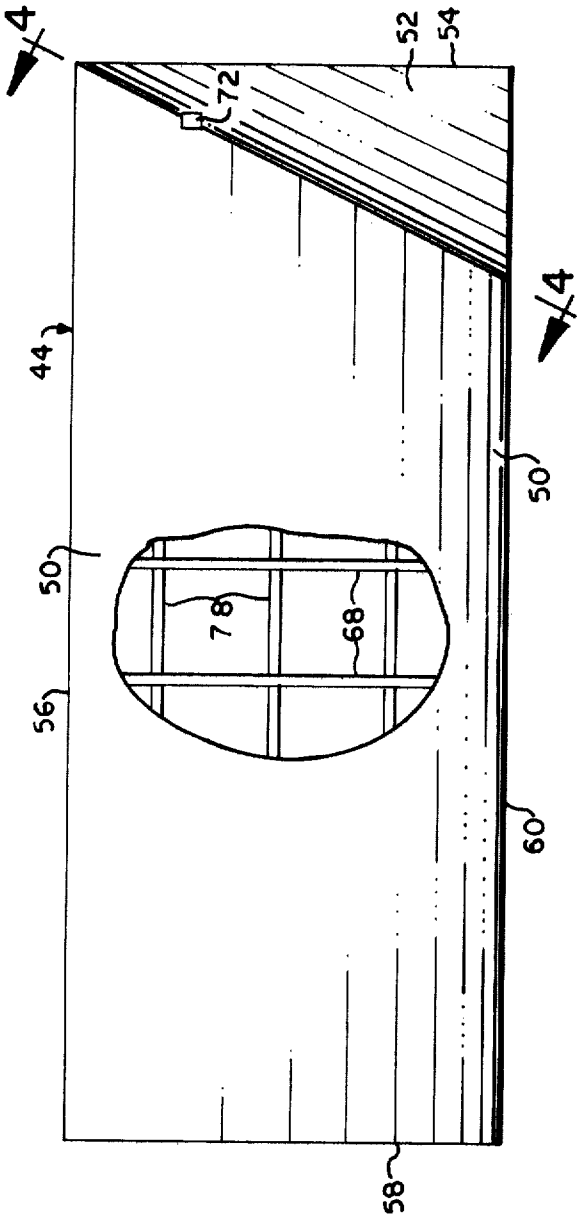


FIG. 2

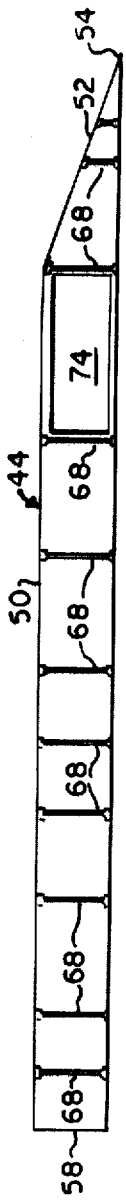


FIG. 3



FIG. 5

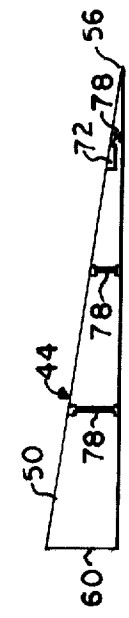


FIG. 4

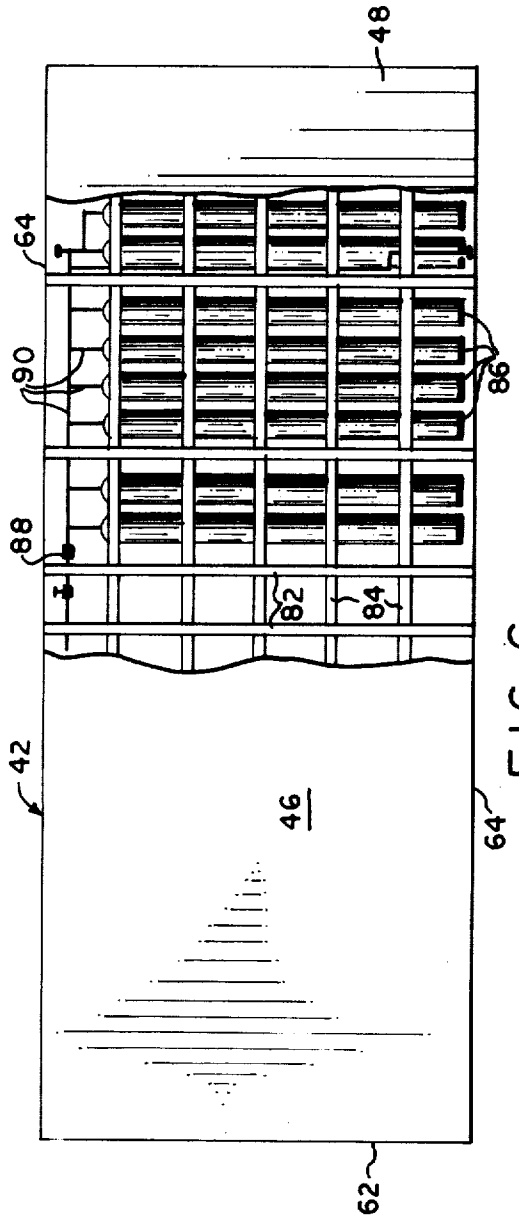


FIG. 6

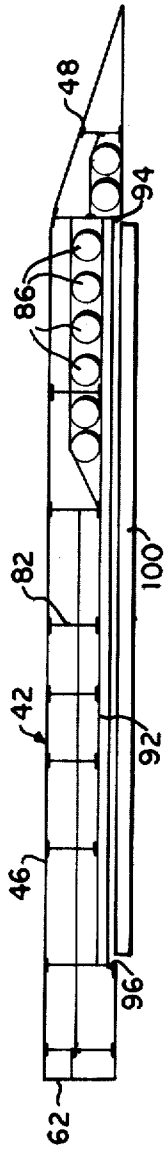


FIG. 7

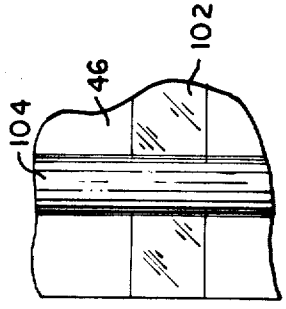


FIG. 8



FIG. 9

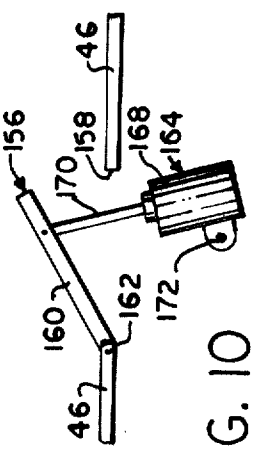


FIG. 10

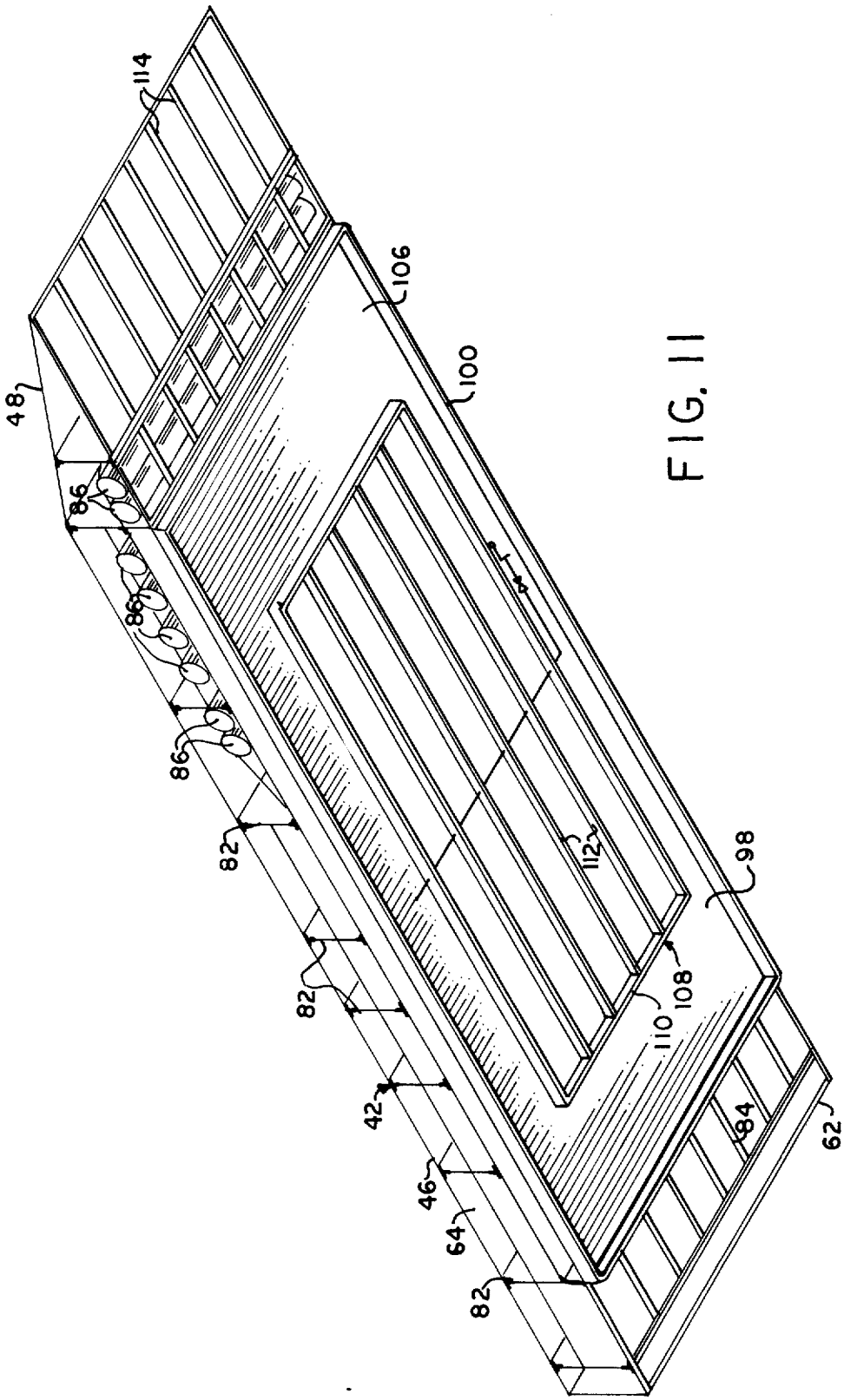


FIG. 11

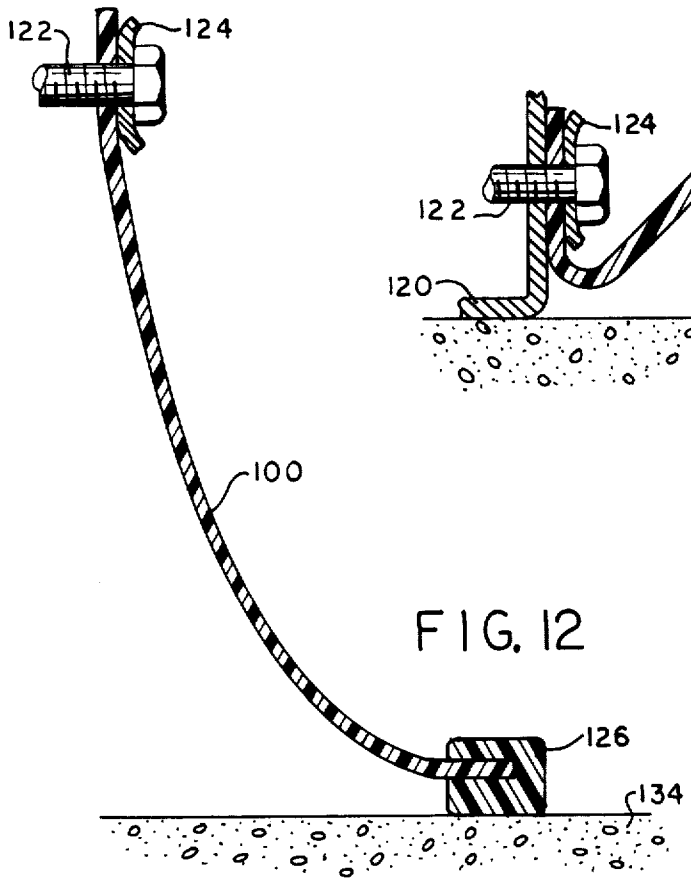


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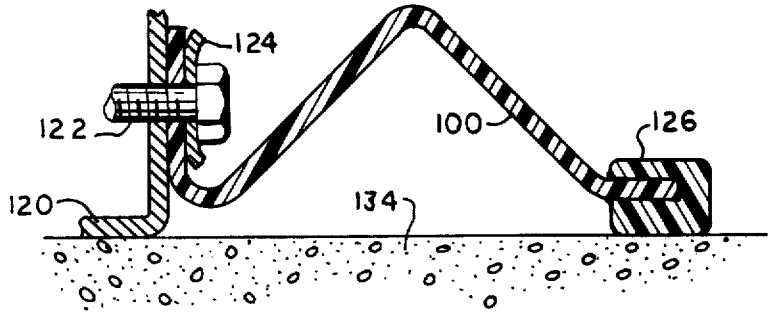


FIG. 13

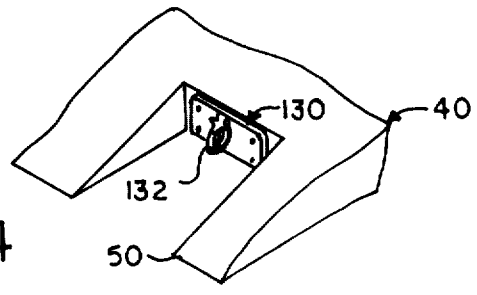


FIG. 14

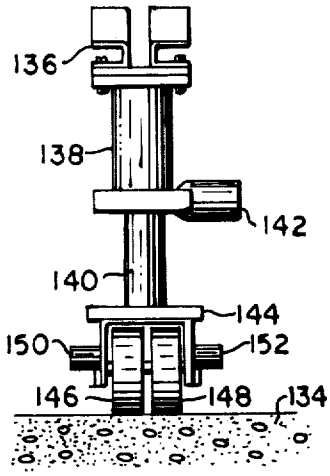


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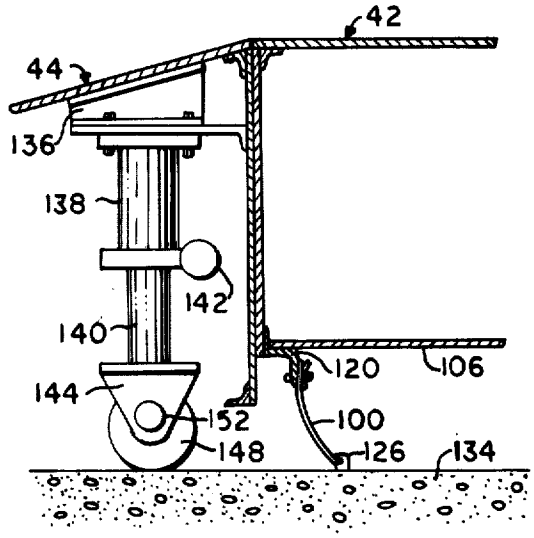


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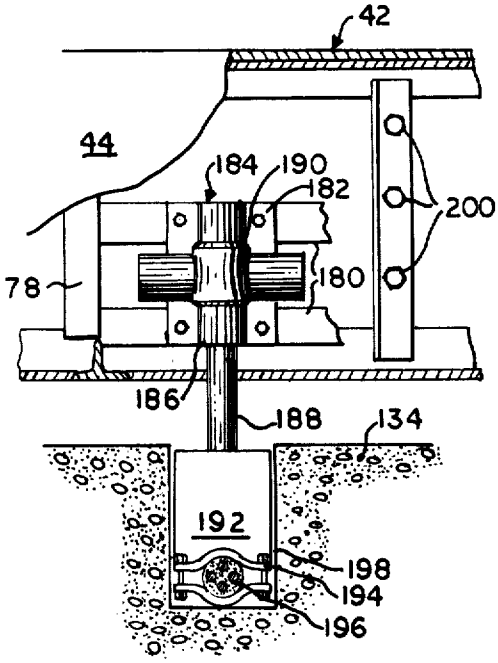


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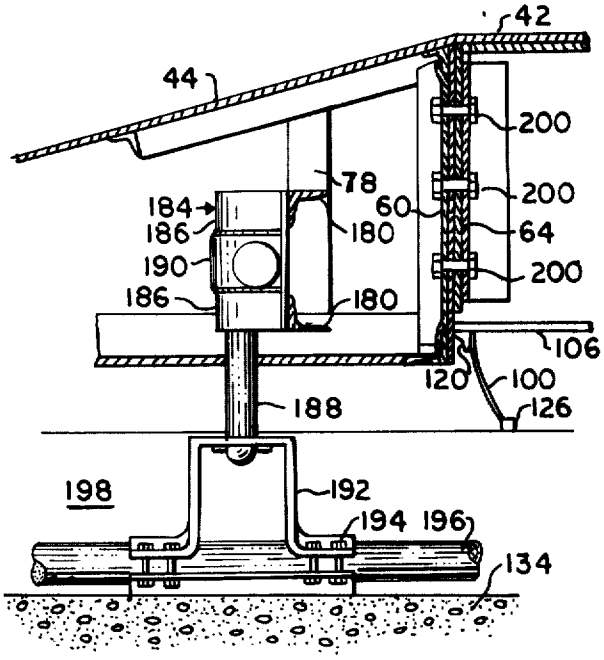


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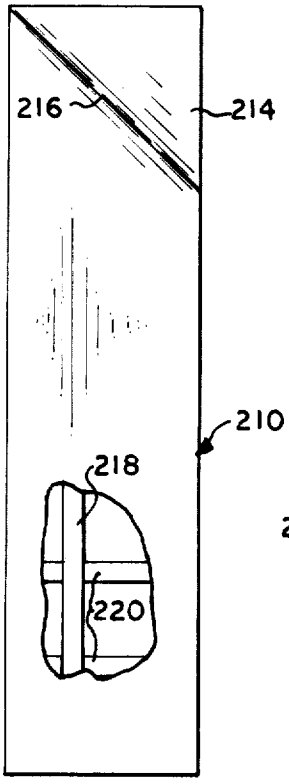


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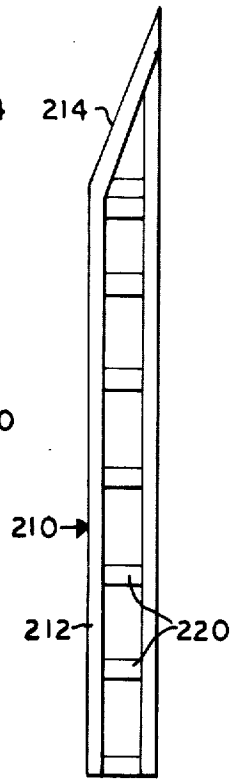


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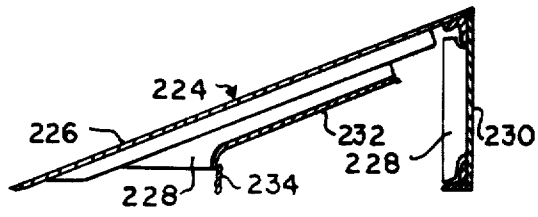


FIG. 21

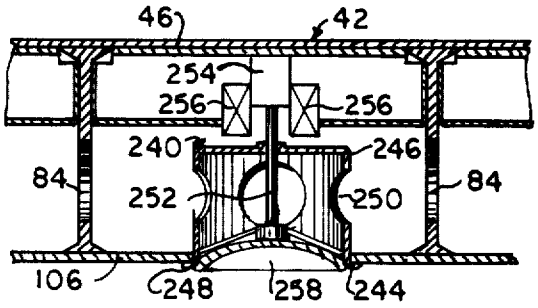


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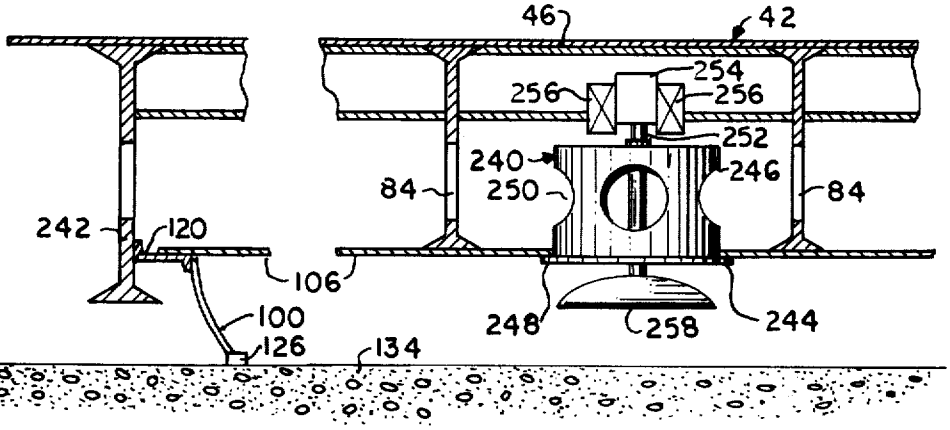


FIG. 22

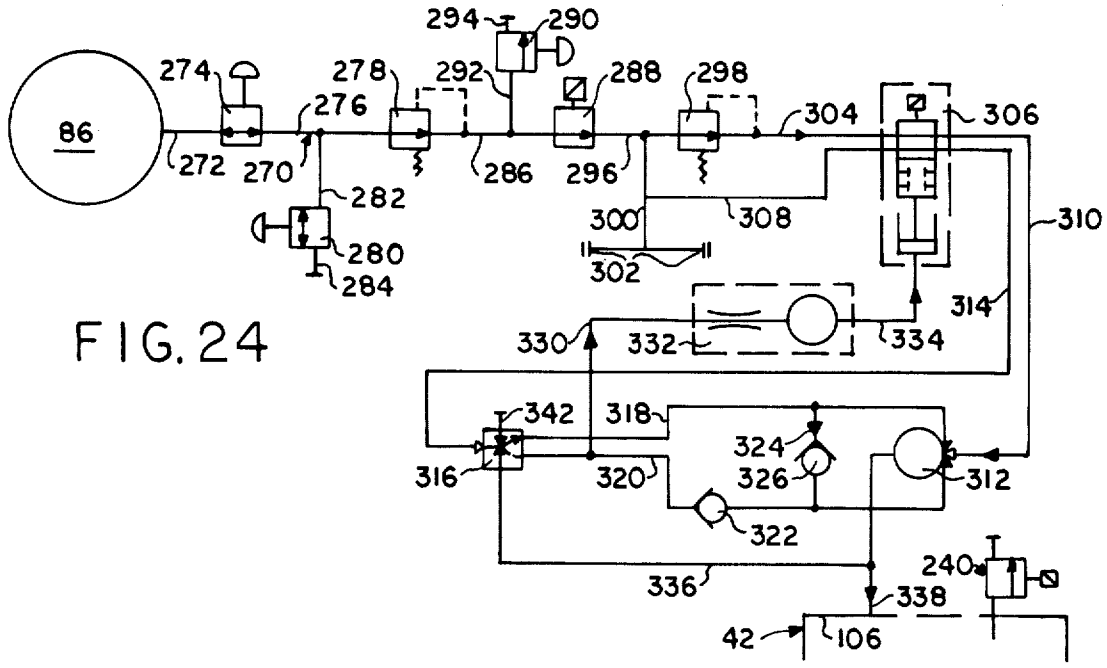
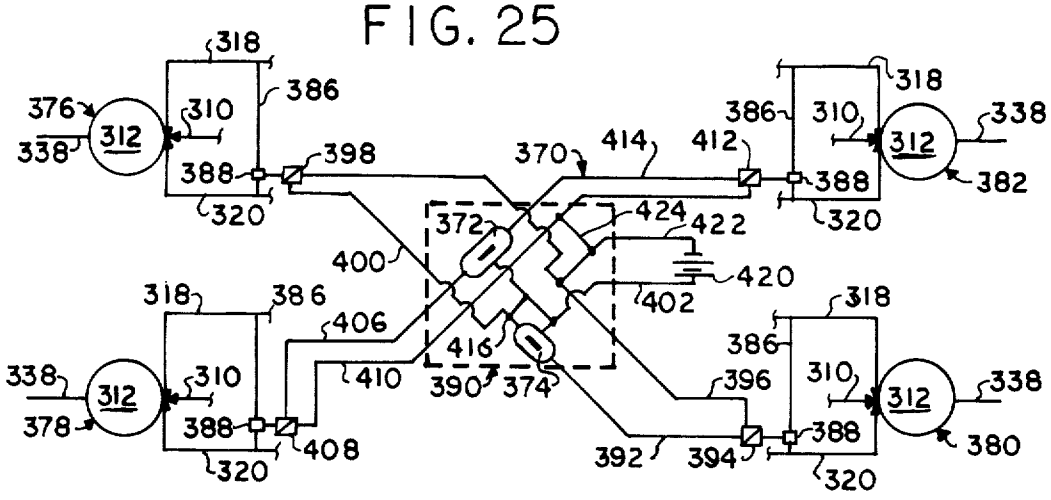


FIG. 24

FIG. 25



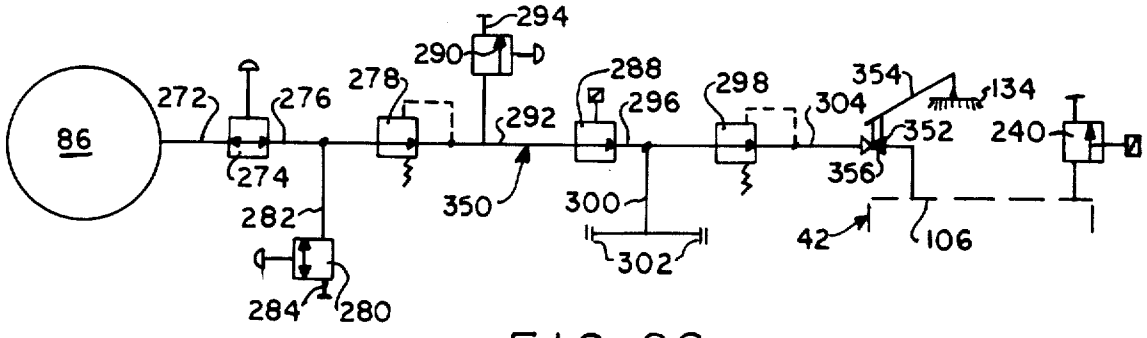


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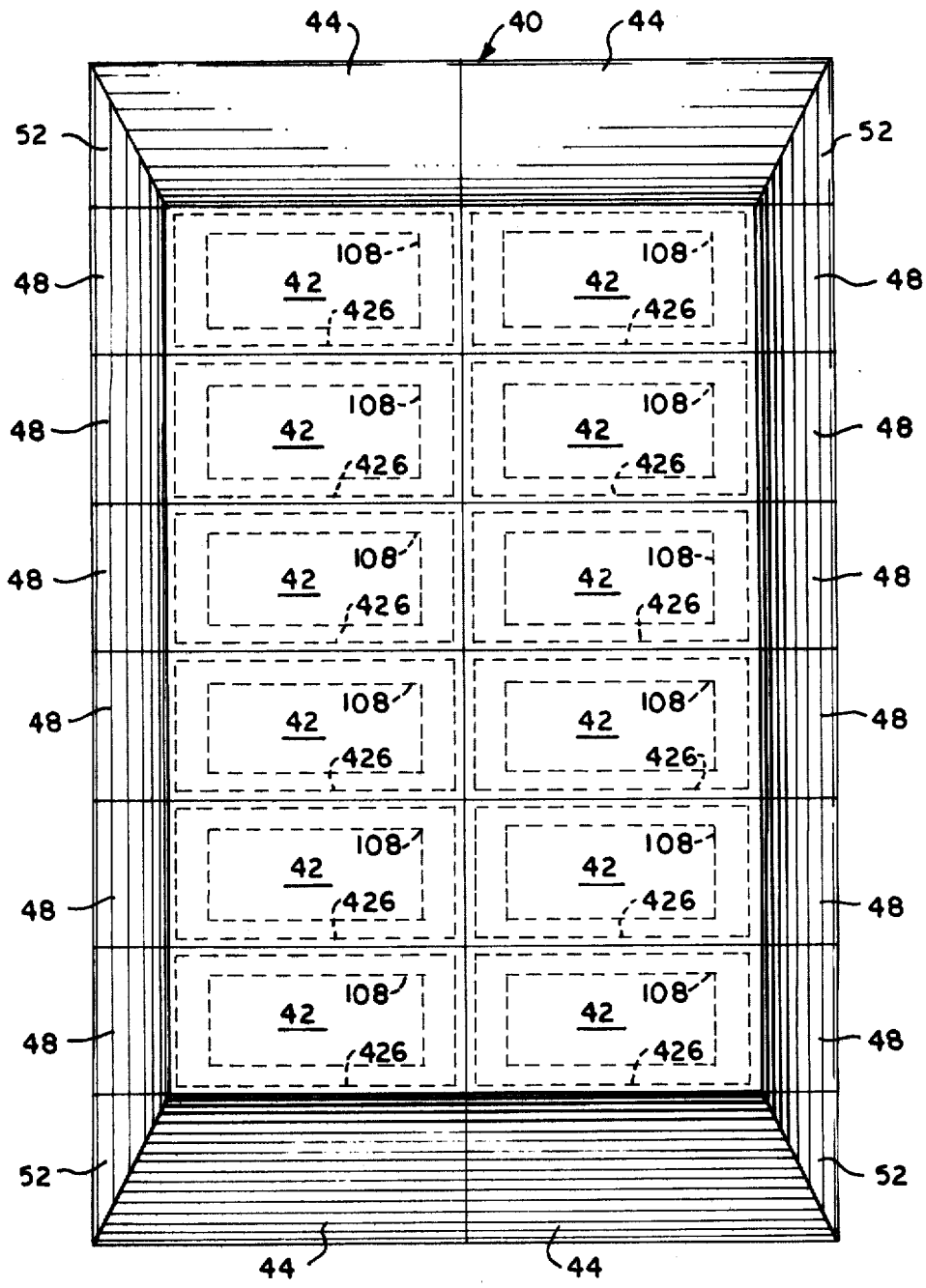


FIG. 27

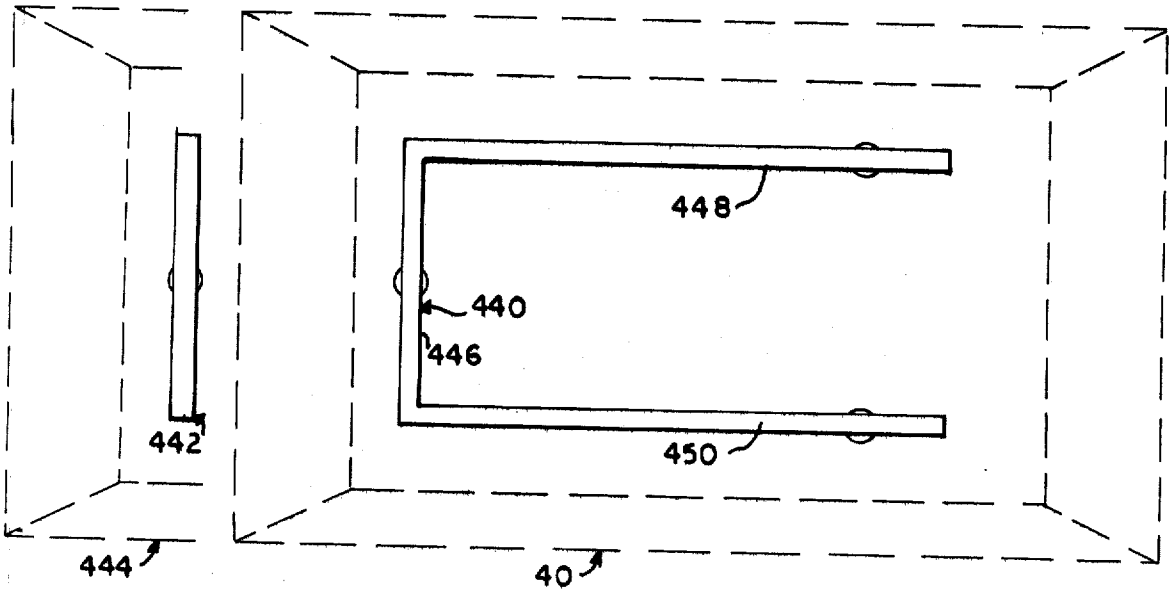


FIG. 28

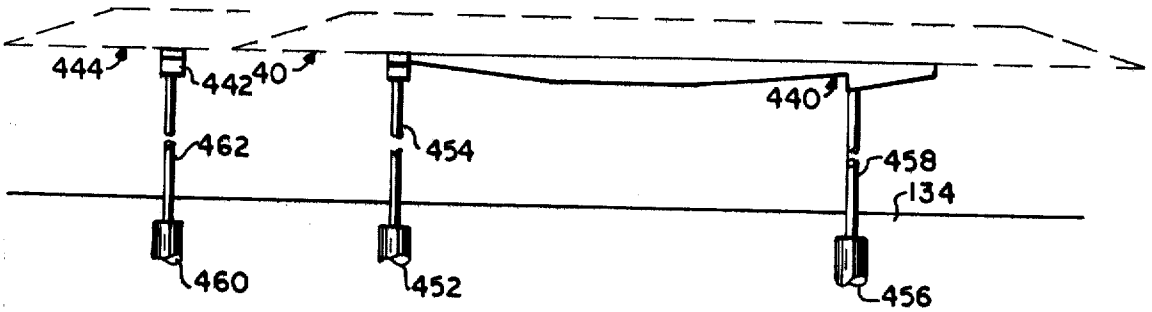


FIG. 29

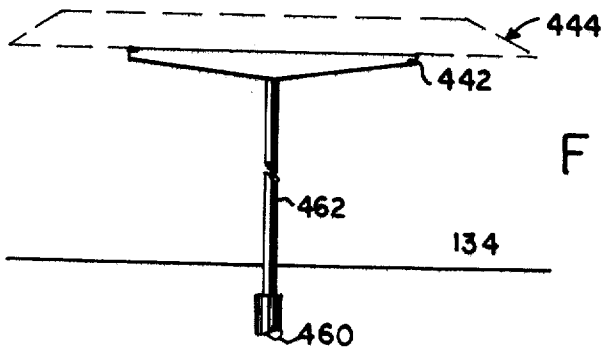


FIG. 30

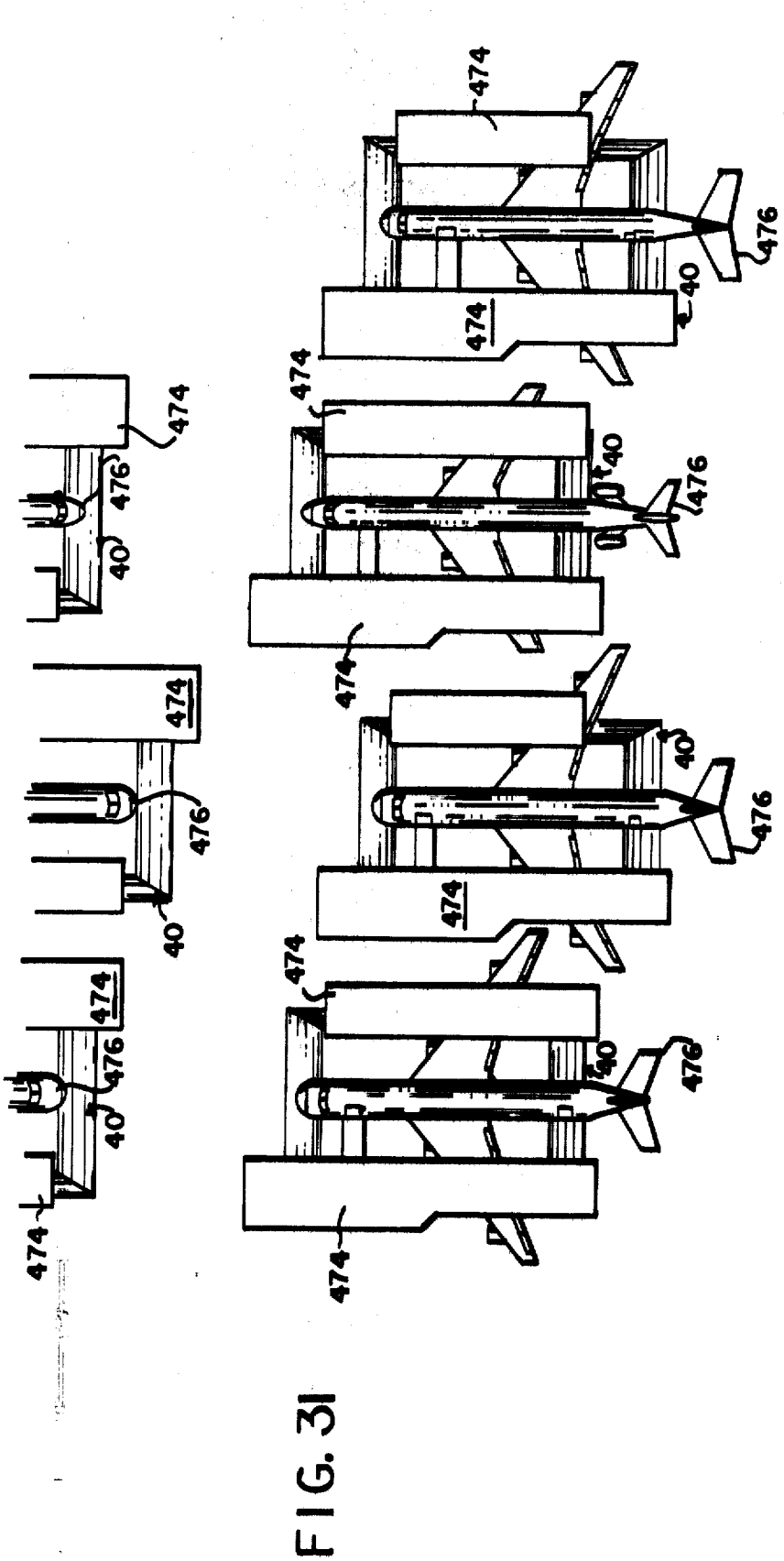


FIG. 31

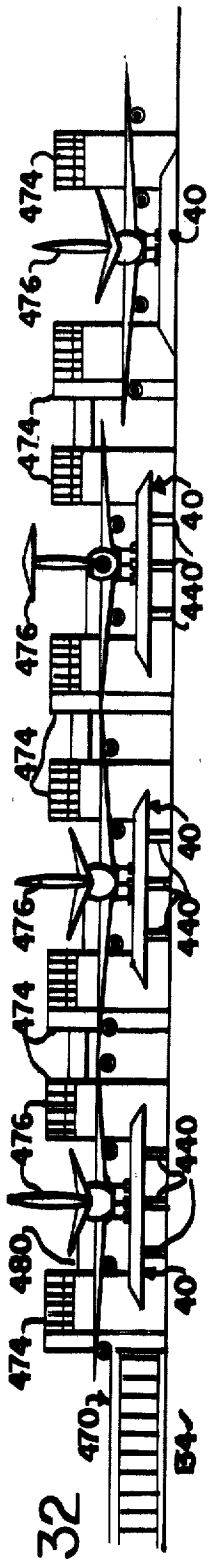


FIG. 32

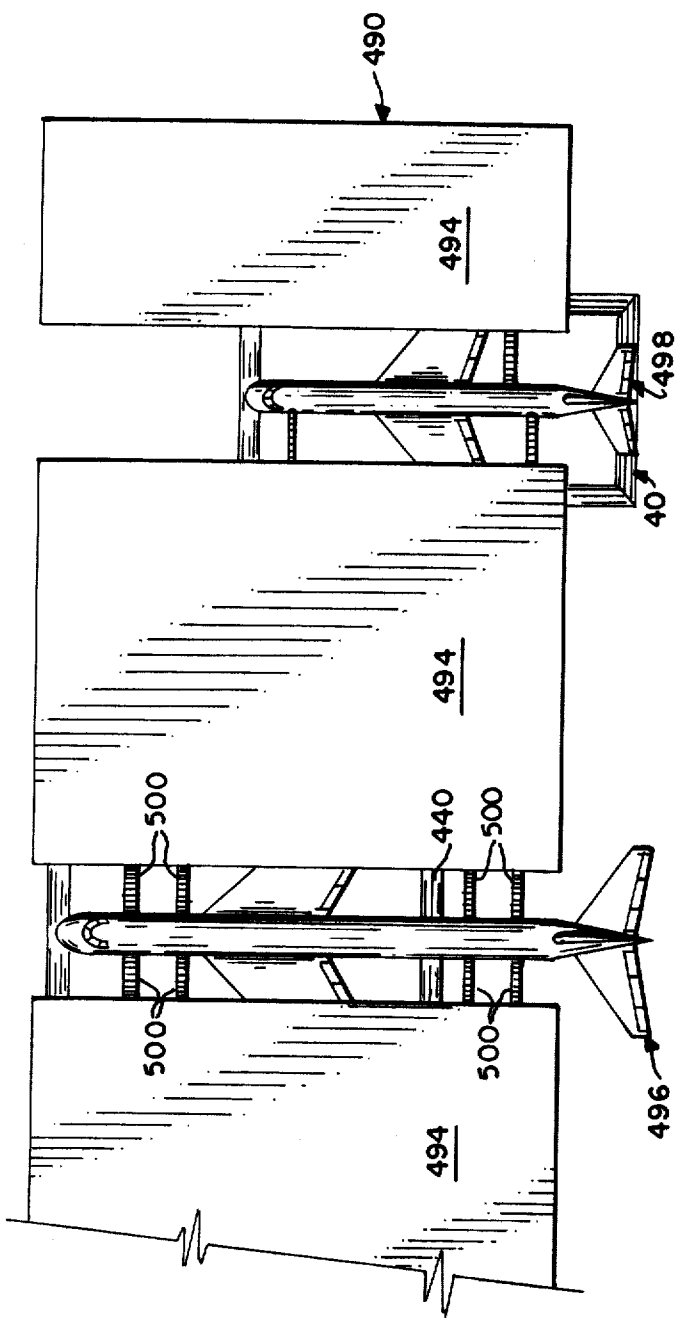

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FIG. 33

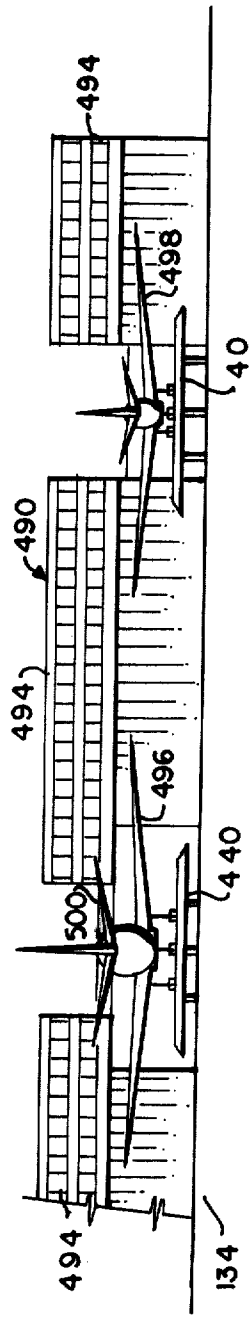

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FIG. 34

GROUND EFFECTS VEHICLE AND AN AIR TERMINAL

This invention is also directed to an air terminal having a ground facility for servicing an airplane, for loading passengers onto and for unloading passengers off of an airplane in less time and with greater safety to both the passengers and to the airplane than previously used ground facilities. Further, cargo and baggage may be more easily and more quickly loaded onto the airplane and unloaded from the airplane.

The ground effects vehicle and the air terminal may be used alone or may be used in conjunction with each other.

An airplane landing at an air facility, not using my ground effects vehicle or my air terminal, upon leaving the runway taxies to an apron under its own power or, with its engines running. This increases the fuel consumption of the airplane so as to increase the cost and also adds pollution to the atmosphere from the products of combustion of the airplane fuel. At the air terminal the ground guidance crews direct the pilot for maneuvering the airplane. The jetways, passenger loading ramps, extend out to meet the airplane for the passengers to unload. Further, there are numerous service vehicles moving around the airplane to service this airplane. For example, there is a baggage service vehicle, a fuel truck, a water truck, a galley truck, and a toilet service vehicle. These vehicles moving around the airplane add congestion and confusion around the airplane and, unfortunately, from time to time one of the vehicles may strike or hit the airplane. Then, it is necessary to inspect the airplane to determine the extent of the damage to the airplane. If the skin of the airplane has been damaged and dented the airplane is not permitted to fly. Instead, it is necessary to move the airplane to a maintenance area where the damage to the airplane is repaired. This may delay the service of the airplane. Further, the airplane is not in use for an indefinite time period and there is money lost due to the inactivity of the airplane.

While an airplane is being loaded with passengers the fuel is piped from a fuel truck to the airplane. There is the possiblility of spillage or leakage of the fuel and therefore the possibility of a fire.

After the airplane has been loaded with passengers the jetways are retracted and by means of two trucks the airplane is backed away from and maneuvered away from the air terminal and manuevered to a taxi area.

While the airplane is still at the terminal, and before being maneuvered to the taxi area, the engines of the airplane are started. The airplane approaches the runway. In certain congested airports and under certain congested conditions it may require a wait of approximately 45 minutes before the airplane, after the engines have been started, is permitted to take off from the runway. In this 45-minute waiting period the engines are running, fuel is being consumed and the products of combustion of this fuel are released to the atmosphere so as to pollute the atmosphere.

With modern airplanes such as the large jet commercial airplanes like the airbus, the 747 and the smaller commercial jet airplanes like the 700 series, the DC-8's and the DC-9's, it is necessary to have substantial ground support area. For example, for these airplanes it is necessary to have a ground support area of approximately 18 inches of reinforced concrete. Further,

there is a tractor for moving these airplanes from the air terminal to the taxi area. With the new large airplanes such as the 747 airplane the tractor is quite large and very powerful. For example, the tractor for moving the 747 is so large and powerful that it can literally tear pieces of concrete out of the apron near the air terminal and also out of the runway. By tearing these pieces of concrete there is damage to the apron and to the taxi area.

In certain instances an airplane may crash or run off of the runway so as to still be relatively intact and yet not capable of flying or not capable of moving under its own power on its own landing gear. Sometimes, the airplane is jacked up or elevated and a dummy landing gear is placed under the airplane and the airplane is towed to better facilites. Further, at certain times the airplane is repaired at the site. Still further, a crane is brought in and the airplane, if it be a small airplane, is lifted onto a flat-bed type trailer and hauled away.

Although, not related to an air terminal or an airport, but still of a similar problem with moving heavy loads, is the problem of servicing certain units in rural and undeveloped areas. For example, missile bases in the United States, such as in North and South Dakota and Montana, are often in rural and undeveloped areas. The terrain around these missile bases may not be friendly and in order to construct the missile bases and to use the bases it is necessary to construct roads for servicing the bases. To use these roads it is necessary to have a road of a certain loadcarrying capacity. In the construction of these missile bases it is necessary to have a road capable of carrying heavy loads. Further, from experience, the use of these roads may be restricted to certain times of the year. For example, the use of these roads may be restricted to the summer, fall and winter. In the spring when the snow is melting and the ground is soft it may not be possible to use these roads for carrying exceedingly heavy loads.

Another example of the necessity of building roads to carry heavy loads is the installation, in Afganistan, of diesel-electric generating sets. For example, 1971 in Afganistan there is scheduled to be installed six diesel-electric generating sets of 2,300 kva. Each of these sets weighs approximately 300,000 pounds. In order to install these sets it will be necessary to construct special roads having the load-carrying capability.

In regard to an air terminal all services at the air terminal are brought to the airplane. There is considerable congestion around the airplane due to the service trucks and service facilities and because of the service trucks and service facilites there is a likely chance of damage to the airplane and therefore the taking of the airplane out of service.

The prior-used air terminals do not economically utilize the service area for the airplane. These terminals require double handling of baggage, cargo, and fuel. Further, the area required by the air terminal is excessively large because of the requirement for airplane maneuvering area. These result in a loss of time, a loss of manpower and more manpower is required to service the airplane and this results in an added expense. Further, the transferring of the fuel from the fuel truck to the airplane is a dangerous function and may result in a fire or an accident.

With this background, having worked as a consulting engineer and worked around airplanes and air terminals I have realized some of the problems involved and

some of the limitations of the facilities for handling airplanes at air terminals and also some of the limitations of the air terminals. Accordingly, I have made the subject invention for a ground effects vehicle and also for an air terminal.

In this invention there is a ground effects vehicle which allows free movement of the airplane around the apron, the taxi area and the maintenance facility, without the use of the airplane engines. The airplane can be moved in these areas and regions on said ground effects vehicle without the airplane engine being operated. The ground effects vehicle rests on a cushion of gas. It is not necessary to operate the airplane engines and therefore there is a savings in fuel and there is less pollution of the air. Further, less area is required for maneuvering the airplane around the air terminal and there is less maintenance expense for the concrete around the air terminal, the apron and the taxi areas. The power required to move the airplane on the ground effects vehicle is very small as the ground effects vehicle is resting on a cushion of gas.

In regard to areas other than an air terminal, such as unfriendly terrain, a less expensive road construction and development is required as the load-carrying requirement of the road is relatively small due to the large surface area of the ground effects vehicle and the small unit loading on the road. Further, with this ground effects vehicle it is possible to move a load over areas of different surface characteristics such as concrete which is relatively smooth, a marsh, snow and earth. The earth may be relatively rough and undulating. For example, the earth may have a washboard appearance or may be in its natural state or in a rough graded state such as a pasture or a plowed field.

Now, in regard to the air terminal there are service facilities at each loading dock. These service facilities are in the core of the loading dock. It is not necessary to have service trucks moving around the airplane. Therefore, there is less possibility of a service truck running into the airplane and damaging the airplane so as to require taking the airplane out of service. The loading facilities may be such that the fuel may be introduced into the airplane through a pipe or flexible tube, the water may be introduced into the airplane through a pipe or flexible tube and the toilet facilities may be drained through a pipe or flexible tube. The galley may be restocked through a jetway connecting with the terminal core. Likewise, baggage may be removed from the airplane and added to the airplane by means of a jetway connecting with the central core. Further, the roof of the air terminal may be utilized for taxi service and helicopter service. There connects with the central core a plurality of loading docks. These loading docks are of a cantilever construction so that the wings of the airplane may pass underneath the loading docks. At the air terminal the airplane is elevated off of the surrounding surface area so as to more readily unload and load passengers and also to service the airplane.

With this background of the ground effects vehicle and the air terminal an object and advantage of this invention at the air terminal is to reduce the turn-around time of the airplane so as to realize more productive use of the airplane; to lessen the possibility of damage to the airplane at the air terminal; to reduce the number of operations and the time of the operations in regard to the maintenance of the airplane at the airport; to increase the space utilization of the airport, said space utilization including both the area around the airport and the air terminal and also the vertical dimension of the air terminal; to reduce the non-revenue producing cost of the air terminal; to provide better accessibility for the passengers with respect to the airplane, both for the passengers loading onto the airplane and the passengers departing from the airplane; to provide better accommodation for the passengers at the airport with respect to reaching the airplane; to provide greater convenience for the passenger to reach the air terminal and also to depart from the air terminal; to reduce the pedestrian traffic within the air terminal; to provide the personnel at the air terminal with a means for more completely and more thoroughly accounting for the passenger loading onto the airplane and departing from the airplane; to provide at the air terminal apparatus for determining the weight and balance of the airplane while docked at the air terminal; and, to provide apparatus at the air terminal for removing ice from the airplane while simultaneously loading and unloading the passengers with respect to the airplane. With respect to the ground effects vehicle at the air terminal an object of this invention is to make it possible to increase the maneuverability of the aircraft at the air terminal; to reduce the maneuvering space for the aircraft at the air terminal; to reduce the cost of maintenance of the taxi and apron areas at the air terminal; to reduce the need of cleaning apparatus, such as snow plows, at an air terminal to keep clean the taxi and apron areas; to reduce, and/or eliminate, the requirements for flight crews around the airport to control the movement of the aircraft from the air terminal to the maintenance area; to reduce the use of the aircraft engines around the air terminals; to lessen the time of operation of the aircraft engines around the air terminals and thereby increase the useful operating time of said aircraft engines; to lessen air pollution, noise pollution and thermal pollution around the air terminals as the aircraft engines are not operating while on the taxi areas and the apron areas around the air terminal; to lessen the operating cost of the aircraft around the air terminals as the aircraft engines are not operating while the aircraft is on the taxi area or the apron area and thereby lessen the amount of fuel required; to increase the maneuverability of the aircraft around and in the maintenance area and maintenance hangar with a minimum of effort; to make possible a greater usage of the area around the air terminal; and, to assist in removing damaged aircraft from the runway area and from the apron and taxi areas around the air terminal. Another object of this invention, with the ground effects vehicle other than at the air terminal, is to allow the transportation of heavy objects and loads over terrain not capable of supporting heavy axle loads as realized with wheel-type vehicles; to reduce the cost of construction of a road bed; to lessen the flow time of construction of a road bed; to make it possible to more readily position a load on said ground effects vehicle for installation at the site of usage; to eliminate double handling of all cargo loads as the ground effects vehicle can serve, both as a lighter and a land vehicle; to be useful in salvage and rescue work in flooded areas; to handle military impedimenta over unimproved terrain; and, to move over undeveloped terrain and to carry loads over undeveloped terrain on an air cushion and which terrain may have elevation variations of approximately 24 inches.

These and other important objects and advantages of the invention will be more particularly brought forth upon reference to the accompanying drawings, the detailed description of the invention and the appended claims.

In the drawings:

FIG. 1 is a fragmentary plan view illustrating a ground effects vehicle and, in particular, an air dock comprising a plurality of primary sections and a plurality of ramp sections;

FIG. 2 is a plan view of a ramp section;

FIG. 3 is a side elevational view of said ramp section;

FIG. 4, taken on line 4–4 of FIG. 2, is an end elevational view of said ramp section; and,

FIG. 5 is a cross-sectional view of said ramp section;

FIG. 6 is a plan view of a primary section, with the duct removed, and illustrates the storage area for the compressed gas reservoirs or tanks;

FIG. 7 is a side elevational view of said primary section of FIG. 6;

FIG. 8, on an enlarged scale, is a plan view, see the area defined by the ellipse of FIG. 6, of the crust area in the duct of the primary section;

FIG. 9, taken on line 9—9 of FIG. 8, illustrates the depressed area of the duct;

FIG. 10, illustrates the raised wheel stop and also illustrates the actuating mechanism for raising the wheel stop;

FIG. 11 is an isometric view looking at the underneath side of a primary section and illustrates a recessed area in the air-tight base and also illustrates the depending circumscribing skirt around said recessed area;

FIG. 12 is a vertical cross-sectional view of the depending skirt or apron circumscribing said air-tight base, and which skirt is extended so as to depend below said primary sections;

FIG. 13 is a cross-sectional view illustrating said apron or skirt being positioned in the recessed portion of said air-tight base and illustrates the hinged portion of said flexible apron or skirt;

FIG. 14 is a fragmentary view of the ramp section and illustrates a towing socket on said ramp section for moving said ground effects vehicle;

FIG. 15 is an end elevational view of a retractable friction drive for said ground effects vehicle;

FIG. 16 is a side elevational view of said retractable friction drive for said ground effects vehicle;

FIG. 17 is an end elevational view of a cable clamp for mating with a cable for moving said ground effects vehicle;

FIG. 18 is a side elevational view of said cable clamp for mating with a cable for moving said ground effects vehicle, and also illustrates the means for joining together a primary section and a ramp section;

FIG. 19 is a plan view of a ramp section and illustrates sound attenuation means and means for allowing gas to escape from underneath the primary section and also means for reducing the dust created by the escapement of said gas from under said primary section;

FIG. 20 is a side elevational view of said ramp section and illustrates said sound attentuation means and said means for allowing gas to escape from underneath said primary section;

FIG. 21 is an end elevational view of said ramp section, on a larger scale, and illustrates said sound attenuation means, means for allowing said gas to escape from underneath said primary sections and means for reducing the dust level due to the escapement of said gas from underneath said primary section;

FIG. 22 is a fragmentary vertical cross-sectional view illustrating the quick dump release means, in an open position, under said primary section for allowing the rapid escape of compressed gas under said primary section, and also illustrates the depending flexible apron or skirt positioned under said primary section and near said recessed portion;

FIG. 23 is a fragmentary vertical cross-sectional view illustrating said quick dump release means under said primary section and in a closed position;

FIG. 24 is a schematic illustration of the apparatus for controlling the flow of compressed gas underneath the ground effects vehicle;

FIG. 25 is a schematic illustration of the leveling apparatus for controlling the level of said ground effects vehicle;

FIG. 26 is a schematic illustration of another apparatus, using a sensing finger for controlling the flow of compressed gas underneath said ground effects vehicle;

FIG. 27 is a plan view of an air dock illustrating a plurality of primary sections and a plurality of ramp sections and, by means of dotted lines in a rectangular pattern, illustrates the recessed portion in each primary section;

FIG. 28 is a plan view of a lifting means at an air terminal and, by means of phantom lines, illustrates a small ground effects vehicle being lifted on a U-shaped lifting device and, by means of broken lines, also illustrates a large ground effects vehicle being lifted by said U-shaped lifting device and also by a straight bar lifting device;

FIG. 29 is a side elevational view of the subject matter of FIG. 28 and illustrates a small ground effects vehicle being lifted by said U-shaped lifting device and also by means of broken lines illustrates a large ground effects vehicle being lifted by said U-shaped lifting device and by said straight bar;

FIG. 30 is an end elevational view showing the straight bar lifting device in an extended position;

FIG. 31 is a plan view of an air terminal and illustrates the concourse, and the cantilevered air docks, and with the airplanes positioned on the ground effects vehicle and at the air docks, and with the passenger loading and unloading ramps extending from the air docks to the airplanes;

FIG. 32 is a side elevational view illustrating said airplanes at the air terminal and with the wings of the airplane underneath said cantilevered air docks and also with the airplanes positioned on the ground effects vehicle and the ground effects vehicle being elevated by said supporting devices, and also illustrates the fact that the airplanes can be so positioned that the wings overlap but do not obstruct the positioning of the airplane with respect to the air docks for loading and unloading passengers;

FIG. 33 is a plan view illustrating the cantilevered air docks of the air terminal, the concourse of the air terminal and illustrates a large airplane such as the 747 being positioned at the air docks and with loading and unloading ramps connecting from the air docks to the airplane, and also illustrates a small airplane such as the 707 being berthed at air docks designed for a 747 and illustrates the loading and unloading ramps connecting with the smaller airplane and also illustrates a service

facility, such as a fuel line, water line or sewage line, connecting from the air dock to the smaller airplane; and,

FIG. 34 is an end elevational view of FIG. 33 and illustrates the airplanes being positioned at the cantilevered air docks with the wings of the airplanes positioned underneath said cantilevered air docks and also said airplanes being positioned on ground effects vehicles and with the ground effects vehicles being elevated so that the loading and unloading ramps can connect with said airplanes, regardless of the size of the airplanes.

In FIG. 1 there is illustrated a plan view of an air dock **40.** The air dock **40** comprises a plurality of primary sections **42** and ramp sections **44.**

Each primary section **42** comprises an upper surface deck **46** and a relief ramp **48.**

Each ramp section **44** comprises two sloping surfaces, a loading ramp **50** and a relief ramp **52.** Also, each ramp section **44** comprises a zero end **54,** a zero side **56,** a connection end **58** and a connection side **60.**

The relief ramp **48** of the primary section **42** is at the outer end of the primary section. The inner ends **62** of the primary sections are joined together. The connection sides **64** of the primary sections **42** are joined together.

More appropriate, the connection side **60** of the ramp section **44** is joined to the connection side **64** of the primary section **42.** The connection end **58** of the ramp section **44** is joined to an adjoining connection end **58** of an adjacent ramp section **44.**

In FIG. 1 it is seen that there are four ramp sections **44** and a plurality of primary sections **42** joined to make the integral air dock **40.**

It is to be realized that the air dock **40** may vary in length because of the variation in the number of primary sections.

In FIGS. **2, 3, 4** and **5** there are various views of the ramp section **44.** In FIG. **2** it is seen that there are numerous lateral support members **68** and numerous longitudinal support members **78.** The ramp section **44** is covered by appropriate materials such as metal like steel or aluminum. The covering for the ramp section **44** is a checker-plate covering.

In FIG. **2** it is seen that there is a guide means **72.** The guide means **72** may be an illuminated guide means.

In FIG. **3** there is illustrated a side elevational view of said ramp section **44.** Also, FIG. **3** illustrates the lateral support I-beams **68.**

Further there is illustrated the battery storage section **74** for electric storage batteries.

In FIG. **5** there is illustrated an end elevational view, taken at the connection end **58** of the ramp section **44,** and illustrates the longitudinal I-beam supports **78.**

In FIG. **4,** taken on line **4—4** of FIG. **2,** there is illustrated the longitudinal I-beam support **78** and the illuminated guide means **72.**

In FIGS. **6–11** there is illustrated details of construction of the primary section **42.**

In FIG. **6,** a plan view of the primary section, there is illustrated the lateral I-beam support members **82** and the longitudinal I-beam support members **84.** Also, there is illustrated the high pressure gas storage vessels **86.** The gas storage vessels **86** have pressure at approximately 1,500 psi. There is a main header **88** and a plurality of connection lines **90** connecting the appropriate gas storage vessels **86** with the main header **88.**

In FIG. **7** it is seen that there is a lower structural member **92.** The lower structural member **92** is elevated a few inches above the peripheral parts on the underneath side of the primary section **42.** More particularly, look at the right part of FIG. **7** and the underneath side and it is seen that the structural member is elevated slightly above **94** on the right end and above the inner end or connection end **96** on the left. This may be referred to as a recessed area **98** in the primary section **42.** Circumscribing the recessed area **98** and connecting with the structural member **92** is a depending flexible apron **100.** The depending flexible apron **100** is detailed in FIGS. **12** and **13.**

In FIG. **8** there is illustrated the guide means **102.** The guide means **102** is flush with the upper surface deck **46** of the primary section **42.** Below the illuminated guide means **102** there may be a source of illumination such as an electric light.

In FIG. **9** there is illustrated the recess **104** in the upper surface deck **46** of the primary section **42.** The recess **104** is a nose wheel well for positioning the nose wheel of an airplane.

In FIG. **10** there is illustrated a hinged stop **156** in the upper surface deck **46** of the primary section **42.** It is seen that the upper surface deck **46** is discontinuous at **158** and that hinged stop plate **160** fills this discontinuity. The hinged stop plate **160** is hinged at **162** to part of the deck **46.**

There is a moving means **164** for raising and lowering said hinged stop plate **160.** The moving means **164** comprises a cylinder **168** and a ram or plunger **170.** The cylinder **168** may be a hydraulic cylinder or a pneumatic cylinder or an electric motor. The cylinder **168** has a flange **172** which connects with the structural frame of the primary section **42.**

The hinged stop plate **160** corresponds to the recess **104,** see FIG. **9,** for stopping the movement of the airplane wheels.

There may be as many stopping means **156** as desired. For example, for various size airplanes the position of the stopping means **156** will vary.

In FIG. **11** there is an isometric view looking at the underneath side of the primary section. There is illustrated the recessed area **98** and the circumscribing flexible apron **100.** Also, in the recessed area **98** and underneath the air-tight base **106** there is a framework **108.** The frame **108** comprises two spaced apart lateral members **110** and a plurality of longitudinal members **112.** Again, the base **106** is an air-tight base and the flexible apron **100** depends from the air-tight base or the framework for the air-tight base. The frame **108** is the support frame for a lifting device which will be described in the latter part of this specification, and which lifting device is referred to by FIGS. **28, 29** and **30.**

In FIG. **11** it is seen that there is illustrated the storage tank **86** for the compressed gas, the lateral I-support beams **82,** the longitudinal I-support beams **84,** the relief ramp **48** and the structural members **114** for said relief ramp **48.**

In FIGS. **12** and **13** there is illustrated the depending flexible apron **100.** The upper end of the apron **100** is attached to an angle member **120** on the lower part of the primary section **42.** The upper part of the flexible depending apron **100** is attached to said angle member **120** by means of a bolt **122.** Between the head of the bolt **122** and the flexible apron **100** is a relief washer

124. On the lower depending end of the flexible apron 100 is a sealing band 126.

The flexible apron 100 may be a flexible reinforced fiberglass. The sealing band 126 may be neoprene or tetrafluoropolyethylene.

In FIG. 12 it is seen that the flexible apron 100 is depending from the primary section 42. In this configuration the air pressure underneath the primary section 42 is forcing upwardly the flexible apron 100. The flexible apron 100 acts as a sealing means to try and contain the gas underneath the primary section 42. In other words, the flexible apron 100 functions as a collapsible valve when positioned between the air-tight base 106 of the primary section 42 and the surrounding surface area. To a degree, the flexible apron 100 and the sealing band 126 conform to the surface of the lower surrounding area. If the surface of the lower surrounding area be irregular the sealing band 126 and the flexible apron 100 will conform to the irregularity so as to try and contain the gas between the air-tight base 100 and the lower surrounding area.

In FIG. 13 it is seen that the flexible apron 100 and the sealing band 126, when the primary section 42 is resting on the lower surrounding area, folds up into the recessed area 98 and underneath the primary section 42. In this manner the flexible apron 100 is not damaged when the primary section 42, or the air dock 40, rests upon the lower surrounding area.

In FIG. 14 there is illustrated a fragmentary portion of the ramp section 44 and the loading ramp 50. In the loading ramp 50 there is a recess 130. In the recess 130 there is positioned a tow ring 132. The tow ring 132 connects with the ramp section 44 by suitable means such as bolts, rivets, and the like. The tow ring 132 makes it possible to tow the air dock 40, or a combination of a ramp section 44 and a primary section 42, when elevated by means of compressed gas being released underneath the air-tight base 106. Actually, with compressed gas being released underneath the air-tight base 106 there is substantially no friction between the air dock 40, or the primary section 42 and the ramp section 44, and the lower surrounding area and it is possible to tow these units with only a minimum of effort.

In FIGS. 15 and 16 there is illustrated another means for propelling the air dock or a ramp section 44 and a primary section 42. In FIG. 16 there is illustrated the primary section 42 and a ramp section 44 connecting with the primary section 42. Also, there is illustrated the depending flexible apron 100 and the sealing band 126. It is seen that the sealing band 126 is in contact with the lower surrounding area 134. Further, it is seen that there is the air-tight base 106. The propelling or traction means is in the ramp section 44.

In the ramp section 44 there is provided a support structure 136. The support structure 136 connects with an air cylinder 138. The air cylinder 138 has a ram 140. An air motor 142 is attached to the air cylinder 138 and moves the air ram 140. On the lower end of the air ram 140 there is a housing 144. The housing 144 houses the wheels 146 and 148. There is associated with the wheel 146 a motor 150 and there is associated with the wheel 148 a motor 152. The motors 150 and 152 may be air motors or may be electric motors. By means of the motors 150 and 152 and the wheels 146 and 148 it is possible to move and to steer the air dock 40 or the combination of the primary section 42 and the ramp section 44.

The air motor 142 sufficiently extends the air ram 140 so that the wheels 146 and 148 are in contact with the lower surrounding area 134.

In FIGS. 17 and 18 there is illustrated a towing mechanism for towing an air dock 40 or a combination of a primary section 42 and a ramp section 44.

In the ramp section 44 there are structural horizontal members 180 which tie into the I-beams 78 of the ramp section. A plate 182 connects with the two structural members 180. The plate 182 positions a bracket 184 having an upper and lower bearing 186. The bearings 186 position a shaft 188. On the shaft 188 is a retainer 190. The shaft 188 is capable of moving vertically in said retainer 190.

The shaft 188 on its lower end connects with a bracket 192. The bracket 192 has a clamping device 194 which clamps onto a cable 196.

In FIGS. 17 and 18 it is seen that in the lower surrounding area, id est, the apron, there is a channel 198. The channel 198 is effectively a housing for the cable 196.

The cable 196 is connected to a winch or yarder mechanism for moving the cable and thereby moving the air dock 40.

In FIG. 18 it is seen that the primary section 42 is connected to the ramp section 44 by means of nuts and bolts 200 which connect the connection side 64 of the primary section 42 to the connection side 60 of the ramp section 44.

The nuts and bolts 200, and the passageways in the primary section 42 and the ramp section 44 serve the purpose of aligning the primary section and the ramp section and also serve the purpose of connecting together into an integral unit the primary section and the ramp section.

In FIGS. 19 and 20 there is illustrated a closure ramp 210 having a main surface deck 212 and a smaller sloping surface deck 214. At the junction of the surface decks 212 and 214 there is a ridge 216.

The closure ramp 210 comprises longitudinal structural members 218 and lateral structural members 220. The structural members are more clearly illustrated in FIG. 20.

The closure ramp 210 may be used with the primary section 42. When used with the primary section 42 it is not necessary to use a ramp section 44 as the closure ramp 210 takes the place of the ramp section 44.

In FIG. 21 there is illustrated a generic ramp section 224 having a surface deck 226 and underneath the surface decks 226 a sound attenuation means 228. On the upper and inner end of the ramp section 224 there is a structural framework 230.

Spaced inwardly and apart from the sound attenuation means 228 is a baffle 232. Depending downwardly from the baffle 232 is a dust skirt 234.

The baffle 232 and the dust skirt 234 assist in decreasing the noise and the amount of dust escaping from underneath the ramp section 224 when a primary section or an air dock is elevated off of the lower surrounding area 134 by means of compressed gas. Naturally, in the use of compressed gas to elevate a supporting structure some gas will escape. With the use of gas at approximately 20 psi the escaping gas will move small objects such as pebbles, broken glass, bits of metal and the like. Further, this escaping gas will move

dust and the like. The baffle **232** and the dust skirt **234** prevent the movement of a considerable number of small objects such as pebbles, glass and metal, and further assist in decreasing the blowing up of the dust. In effect, they provide a settling chamber or an expansion chamber in which the dust can settle.

Now, in regard to the sound attenuation means **228** the escaping gas will make a considerable noise and to lessen this noise there is provided a sound attenuation means which baffles the noise. This makes it possible for people working around the air dock to have more pleasant working conditions.

The generic ramp section **224** is used in its broadest sense as a similar structure that can be used for the ramp section **44**, the relief ramp **52** or the relief ramp **54**. In the ramp section **44**, the relief ramp **52**, the relief ramp **48**, and the closure ramp **210** there may be provided a baffle such as baffle **232**, a dust skirt such as dust skirt **234**, and a sound attenuation means such as sound attenuation means **228**.

In FIGS. **22** and **23** there is illustrated an emergency quick dump valve **240**.

The emergency quick dump valve **240** is positioned in the primary section **42** and also with respect to the air-tight base **106**. It is seen that there are the lateral I-beams **84**. Also, in FIG. **22** it is seen that there is the circumscribing main I-beams **242**. The I-beams **242** extend below I-beams **84**.

In the air-tight base **106** there is a passageway **244**. A housing **246** fits in this passageway so as to be air tight with respect to the passageway **244**, as is illustrated in FIGS. **22** and **23**. The housing **246** has a circumscribing lip **248**.

The housing **246**, above the air-tight base **106**, has a plurality of openings **250**.

There is a rod **252** which extends through an opening in the upper part of the housing **246**. On the upper end of the rod **252** there is an iron core or a soft iron member **254**. It is seen that the iron member **254** is partially housed in a solenoid **256**.

On the lower end of the rod or shaft **252** there is a valve plate **258**. The valve plate **258** mates or seats on the circumscribing lip **248**.

In FIG. **23** it is seen that the valve plate **258** is faced or in contact with the circumscribing lip **248** so that the valve **240** is closed. In other words, the compressed gas under the primary section **42** cannot escape through the valve **240**. Also, in FIG. **23** the solenoid is not actuated.

Now, in FIG. **22** the solenoid **256** has been actuated so that the iron core **254** has been drawn into the solenoid and the valve plate **258** has been lowered downwardly from the valve housing **246** and the valve plate is moved away from the circumscribing lip **248**. The compressed gas under the primary section **42** can escape between the valve plate **258** and the circumscribing lip **248** and out through the openings **250** in the housing **246**. Pressure in the air-tight base **106** is thus released and the primary section **42** is no longer supported by the pressure in air-tight base **106**.

At certain times it may be necessary to suddenly stop the air dock **40** or the primary section **42** as it is being towed or moved on the air cushion underneath the air dock or the primary section. An easy way to stop the movement of the air dock or the primary section is to let the air cushion escape so that the air dock or primary section settles onto the lower surrounding area. This is readily accomplished by opening the valve **240** so the compressed gas can escape.

In FIG. **24** there is illustrated a pressure control system **270** comprising a source **86** of compressed gas. The compressed gas in **86** may be at a pressure of approximately 1,500 psi. A line **272** connects with **86** and also connects with a manual shut-off valve **274**. The manual shut-off valve by means of a line **276** connects with a first gas reducing means **278**. The first gas reducing means **278** reduces the pressure of the gas from approximately 1,500 psi to a pressure in the range of about 90 to 100 psi.

There connects with the line **276** a manual control valve **280**. The valve **280** by means of a line **282** connects with a line **276**. The valve **280** controls the recharging of the gas into the container **86**. The valve **280** by means of a line **284** connects with the source of high pressure gas for recharging the container **86**.

The first pressure reducer for the gas, **278**, by means of a line **286** connects with a solenoid control valve **288**.

A control valve **290** by means of a line **292** connects with a line **286**. The valve **290** by means of a line **294** connects with the starting engine for the aircraft engine. The manual control valve **290** controls the flow of gas to the starting engine.

The solenoid valve **288** by means of a line **296** connects with a second pressure reducing means **298**. The pressure reducing means **298** reduces the pressure from the range of approximately 90 to 100 psi to approximately 20 psi.

A line **300** connects with a line **296** and also connects with the quick connect and disconnect fittings **302**.

The second pressure reducing means **298** by means of a line **304** connects with a manual control valve **306**. The valve **306** is a dual control valve which controls the flow of air underneath the primary section **42** and to the recessed portion of said primary section and also controls a high pressure operating air for the system.

The line **300** by means of a line **308** connects with the dual control valve **306**.

The dual control valve **306** by means of a line **310** connects with a vortex amplifier **312**.

The dual control valve **306** by means of a line **314** connects with a mono-stable proportional amplifier **316**.

The mono-stable proportional amplifier **316** by means of a line **318** connects with a vortex amplifier **312**. Also, the mono-stable amplifier **316** by means of a line **320** connects with the vortex amplifier **312**. In the line **320** there is a check valve **322**. Also, between the lines **318** and **320** there is a line **324**. In the line **324** there is a check valve **326**.

The check valve **322** prevents the flow of gas from the vortex amplifier **312** to the mono-stable proportional amplifier **316**. Further, the check valve **326** prevents the flow of gas from the line **320** to the line **318**.

A line **330** connects with the line **320** and also connects with the time delay unit **332**. The time delay unit **332** connects with the dual control **306** by means of a line **334**.

A line **336** connects with the vortex amplifier **312** and also with the mono-stable proportional amplifier **316**. A line **338** connects with the line **336** and also connects with the air-tight base **106** of the primary section **42**.

In FIG. **24** it is seen, schematically illustrated, that the emergency quick dump valve **240** connects with the air-tight base **106.**

Now, the solenoid control **288** electrically connects with the emergency quick dump valve **240** so that when the quick dump valve **240** opens the solenoid valve **288** closes so as to stop the waste of compressed gas in the container **86.**

The mono-stable proportional amplifier **316** connects to the atmosphere by means of a line **342.**

In operation the vortex amplifier **312** controls the flow of compressed gas through line **338** to the air-tight base **106** of the primary section **42.** For example, if the pressure of the gas underneath the air-tight base **106** is too low then the flow of gas from the vortex amplifier **312** through the line **336** to the mono-stable proportional amplifier **316** is not sufficient to stop the flow of gas to the vortex amplifier by means of line **318.** This means that there is a greater flow of compressed gas from **316** through the line **318** to the vortex amplifier **312** and through line **338** to the air-tight base **106.** Now, when the pressure of the compressed gas in the air-tight base **106** reaches a sufficient pressure the flow of gas through line **336** and to the mono-stable proportional amplifier **316** is sufficiently great to cause the mono-stable proportional amplifier **316** to redirect the flow of the compressed gas from line **314** to line **320** and to the vortex amplifier **312** and thereby cut down the flow of compressed gas through the line **338** to the air-tight base **106.** Then, when the pressure in the air-tight base **106** falls, the mono-stable proportional amplifier **316** directs the flow of compressed gas through the line **318** to the vortex amplifier **312** and from the vortex amplifier **312** through the line **338** to the air-tight base **106.** This is a self-regulating type of system using the mono-stable proportional amplifier **316** and the vortex amplifier **312.**

In order to not release a large quantity of compressed gas when the pressure in the air-tight base **106** rapidly falls the time-delay unit **332** delays the shifting of the dual control valve **306** so as to cause a few seconds delay in the flow of gas from the line **304** through the dual control valve **306** and to the vortex amplifier **312.** This assists in conserving the amount of compressed gas and also assists in preventing a hunting action taking place by the part of the monostable proportional amplifier. **316** on the vortex amplifier **312.**

In FIG. **26** there is illustrated a ground control system **350** comprising many of the components of the pressure control system **270.** The same reference numerals will be used for the same components for both the pressure control system **270** and the ground system **350.** In the line **304** there is a mechanically controlled valve **352.** The mechanically controlled valve **352** has a sensing arm **354** which senses the position of the lower surrounding area **134.** A line **356** connects with the valve **352** and the air-tight base **106.**

In FIG. **26** it is seen that the sensing arm **354** controls the state of the valve **352.** Likewise, the position of the primary section **42** with respect to the lower surrounding area **134** controls the position of the sensing arm **354.** When the primary section **42** is close to the lower surrounding area **134** the sensing arm **354** opens the valve **352** so that compressed gas can flow through the line **356** to the air-tight base **106.** Now, when the primary section **42** is elevated away from the lower surrounding area **134** the sensing arm **354** is so positioned that the valve **352** is closed and compressed gas does not flow through the line **356** to the air-tight base **106.**

In FIG. **25** there is illustrated a leveling system **370.** The leveling system **370,** is symbolically illustrated, and comprises a first single pole double throw mercury switch **372** and a second single pole double throw mercury switch **374.**

There are illustrated four vortex amplifiers **312.** It is to be understood that each of these vortex amplifiers may operate one system for compressed air leading underneath a primary section to an air-tight base **106** or may operate a multiplicity of vortex amplifiers leading to air-tight bases **106.** For ease of identification the upper left vortex amplifier **312** will also be give reference numeral **376;** the lower left vortex amplifier **312** will be given reference numeral **378;** the lower right vortex amplifier **312** will be given reference numeral **380;** and, the upper right vortex amplifier **312** will be given reference numeral **382.** Another way of considering this is that these vortex amplifiers **376, 378, 380** and **382** are at approximately four corners of the air dock or at four corners of a plurality of primary sections. Another way of considering these vortex amplifiers is that vortex amplifier **376** is in the northwest part; vortex amplifier **378** is in the southwest part; vortex amplifier **380** is in the southeast part; and, vortex amplifier **382** is in the northeast part. Each vortex amplifier **312** connects with a pneumatic line **338.** Similarly, there leads into each vortex amplifier **312** a pneumatic line **310,** a pneumatic line **318** and a pneumatic line **320.**

Between each pneumatic line **318** and **320** there is positioned a pneumatic line **386.** In the pneumatic line **386** there is a solenoid control valve **388.** The purpose of the line **386** is to equalize the pressure between the pneumatic lines **318** and **320.** By opening the solenoid control valve **388** the pneumatic line **386** allows an equal gaseous pressure between the lines **318** and **320.** Then, there is a free flow of gas through the pneumatic line **310** to the vortex amplifier **312** and from the vortex amplifier **312** through the line **338** to the air-tight or gas-tight base **106.**

The control for the solenoid operated valve **388** is an electrical control station **390.** The control station **390** comprises the two switches **372** and **374.**

The switch **374** by means of an electrical line **392** connects with the solenoid **394** associated with the vortex amplifier **380.** Also, the solenoid **394** controls the valve **388** associated with the vortex amplifier **380.** The solenoid **394** by means of line **396** connects with the solenoid **398.** The solenoid **398** is associated with the vortex amplifier **376.** The solenoid **398** by means of the electrical line **400** connects with the switch **374.** The switch **374** by means of the electrical line **402** connects with the electrical power source **420** or electrical battery **420.**

The switch **372** by means of the electrical line **406** connects with the solenoid **408.** The solenoid **408** controls the valve **388** associated with the vortex amplifier **378.** The solenoid **408** by means of the electrical line **410** connects with the solenoid **412.** The solenoid **412** controls the valve **388** associated with the vortex amplifier **382.** The solenoid **412** by means of a line **414** connects with the switch **372.** The switch **372** by means of the electrical line **416** connects with the electrical line **402.**

In FIG. 25 it is seen that the switches 372 and 374 are positioned at right angles with respect to each other and are also positioned at a diagonal with respect to the vortex amplifiers. For example, the switch 372 is positioned at substantially a diagonal with respect to the vortex amplifier 382 and the vortex amplifier 378. Likewise, the switch 374 is positioned at substantially a diagonal with respect to the vortex amplifier 380 and the vortex amplifier 376.

For example, assume that one part or one corner of the air dock 40 is lower than the other three corners of the air dock 40. For illustrative purposes assume that the vortex amplifier 376 and the associated structure of the air dock 40 is at a lower level than the other vortex amplifiers 378, 380 and 382. Then, the mercury switch 374 is positioned so that the lines and electrodes 400 and 402 connect with each other. The solenoid 398 is actuated so that the valve 388 associated with the vortex amplifier 376 is open. There is a free flow of gas through the line 386 to the pneumatic lines 318 and 320 resulting in a free flow of gas through the pneumatic line 310 to the vortex amplifier 312 and through the line 338 to the air-tight base 106 in the vicinity of the vortex amplifier 376.

Likewise, if the left side of the air dock, that side of the air dock associated with the vortex amplifiers 376 and 378, was lower than the right side of the air dock then the switches 372 and 374 would assume such a position that the solenoid 398 and the solenoid 408 were actuated so as to open the pneumatic valve 388 associated with the vortex amplifiers 376 and 378 so as to allow more air to flow through the vortex amplifiers 376 and 378 to the pneumatic line 338 and to the air-tight bases associated with these vortex amplifiers.

Another illustration is if the lower part of the air dock 40 were at a lower level, that part of the air dock associated with the vortex amplifiers 378 and 380, than the upper part of the air dock then both the switches 372 and 374 would assume such a position that the solenoid 408 and the solenoid 394 would be actuated to open the pneumatic valve 388 associated with the vortex amplifier 378 and to open the pneumatic valve 388 associated with the vortex amplifier 380. This would allow more air to flow through the vortex amplifiers 378 and 380 and through the pneumatic line 338 to the air-tight bases 106.

The leveling system 370 makes it possible, with a minimum of components parts, to maintain substantially level the air dock 40 for a plurality of primary sections.

In FIG. 25 it is seen that there is provided a source 420 of electrical energy for the leveling system 370.

The source 420 of electrical energy may be a battery. The battery 420 by means of electrical line 422 connects with the electrical line 396. An electrical line 424 connects with the electrical line 422 and the electrical line 410.

The electrical battery by means of an electrical line 402 connects with the single pole double throw mercury switch 374. An electrical line 416 connects with the electrical line 402 and with the single pole double throw mercury switch 372.

In FIG. 27 there is illustrated a plan view of the air dock 40 and which air dock comprises a plurality of primary sections 42 and a plurality of ramp sections 44.

The primary section comprises a circumscribing structural frame 426. In the central portion of each primary section there is a supporting frame 108. The supporting frame 108 is designed to transfer the load from a lifting device to essentially all of the air dock 40.

It is seen that on the inner ends of adjoining primary sections 42 there is a reinforced framework.

In FIGS. 28, 29 and 30 there are illustrated lifting devices 440 and also 442. The lifting devices 440 and 442 are designed to move vertically with respect to the lower surrounding area 134.

In FIGS. 28, 29 and 30 there is illustrated a first air dock 40, The first air dock 40 is designed for smaller airplanes such as the 707, 727, 737, DC-8 and DC-9.

Further, in FIG. 28 there is illustrated a larger air dock 444. It is seen that the larger air dock 444 includes the smaller air dock 40. The larger air dock 444 is designed to accommodate the larger airplanes such as the C-5A, 747, DC-10 and comparable airplanes. It is to be realized that the length of the air dock can be readily changed by the insertion or removal of primary sections 42. The primary sections 42 can be standardized and can be added or taken from an air dock to vary the length.

In FIG. 28 it is seen that the lifting device 440 is in a generally U-configuration having a base 446 and a leg 448 and a leg 450. There is positioned underneath the base 446 a fluid actuated cylinder 452 having a ram 454. Similarly, there is positioned under the legs 448 and 450 a fluid actuated cylinder 456 having a ram 458. It is seen that the rams 454 and 458 connect with and support the lifting device 440. The fluid actuated cylinders 452 and 456 are buried in the lower surrounding area. It is possible to retrack the rams 454 and 458 into said cylinders so that the lifting device 440 is substantially flush with the lower surrounding area. In other words, the lower surrounding area is recessed to accommodate the lifting device 440 so that when the rams are retracted the upper surface of the lifting device 440 is substantially flush with the lower surrounding area 134.

Now, with the larger air dock 444 there is used another lifting device 442 consisting of essentially a bar or a structural frame in the configuration of a bar. There is associated with the lifting device 442 a fluid actuated cylinder 460 having a ram 462. Again the ram 462 can be retracted into the cylinder 460 so that the upper surface of the lifting device 442 is substantially flush with the upper surface of the lifting area 134.

In FIG. 30 there is an end elevational view of said lifting device 442, the ram 462 and the fluid actuated cylinder 460.

The lifting devices 440 and 442 can contact the lifting frame 108 under the primary sections 42. The lifting frame 108 is designed to receive the lifting devices 440 and 442. By means of these lifting devices 440 and 442 it is possible to elevate the air dock and thereby elevate the airplane to a desired height at the air terminal. The horizontal movement of the platform and the airplane may be considered to be in the horizontal X-coordinate and the horizontal Y-coordinate and the vertical movement may be considered to be in the Z-coordinate.

In FIGS. 31 and 32 there is illustrated an air terminal 470 having a concourse or main core and loading facilities 474. The concourse or main core 472 rests upon the lower surrounding area 134. The loading facilities 474 are of a cantilevered construction and are positioned well off of the ground so that an airplane 476

can be moved on an air dock to the loading facilities **474** and the main core **472** and with the wings of the airplane underneath the cantilever loading facilities **474.**

In FIGS. **31** and **32** the airplanes are on 120-foot centers.

In FIGS. **31** and **32** it is seen that the airplane **476** is positioned on the air dock **40** and the air dock **40** is positioned on the lifting device **440.** The lifting device **440** elevates the air dock **40** so that the airplane is at a proper height for the loading and the unloading facilities **480** to connect with the airplane. The loading and unloading facilities **480** may be a cantilevered walkway or a telescopic walkway. The cantilevered walkways **480** make it possible for a passenger to walk between the airplane and the loading facility **474** at substantially a level position.

Further, there is positioned between the airplane **476** and the loading facility **474** a conveyor **482** for conveying bags, freight and the like between the airplane and the loading facility.

In FIGS. **31** and **32** the airplane to be serviced by the air terminal **470** is of the size of the 707 , the 727 , the 737 , the DC-8 and the like.

Also, in FIGS. **31** and **32** it is seen that the wings of the airplanes may overlap each other and yet not have interference with each other as the air dock **40** can be lowered so that the airplane on the air dock can be lowered and moved away from the air terminal **470** without the wings of the airplanes contacting each other.

The roof or upper deck of the air terminal **470** may be flat so that automotive vehicles such as taxis and buses may travel onto the roof. Likewise, the roof of the air terminal **470** may be designed to have helicopter landing pads. In this manner there may be realized quicker passenger service.

In FIGS. **33** and **34** there is illustrated another configuration of an airport **490** having a main core or concourse **492** and loading facilities **494.** The main concourse **492** is positioned on the lower surrounding area. The loading facilities **494** connect with the main core **492** and are of a cantilever construction so that the wings of the airplane may pass underneath the loading facilities.

In FIGS. **33** and **34** it is seen that there is a jumbo jet **496** and a standard jet **498.** The jumbo jet **496** is positioned on an air dock **444.** The standard jet **498** is positioned on an air dock **40.**

In FIG. **33** it is seen that the loading facility **494** by means of walkways **500** connects with the jumbo jet **496.** Further, the walkways **500** are ten in number. It is possible by means of the air terminal **490** to have 10 walkways between the loading facilities **494** and the jumbo jet **496.**

The elevation of the jumbo jet **496** can be varied because of the ability to vary the elevation of the air dock **444.**

In FIG. **3** it is also seen that there are two walkways between the loading facilities **494** and the normal jet **498.**

Again, the roof of the air terminal **490** may be flat and of such a structure that automotive vehicles like taxis and buses may drive on the roof to deliver passengers close to a convenient loading facility **494.** Also, the roof structure may be designed to receive a helicopter for convenience of the passengers and also for quick handling of the passagers.

As can be readily appreciated from the air terminals **470** and **490** it is possible to readily handle many of the services for an airplane. For example, instead of a baggage service vehicle there may be used a baggage ramp for a tube. Then, instead of a fuel truck around the airplane the fuel may be in the main core of the air terminal and the fuel may be transferred from the air terminal to the airplane by means of a flexible hose. In regard to watering the airplane or providing water for the airplane a flexible hose connecting with the water supply in the main terminal can connect with the airplane to replenish the water supply. Also, in regard to the galley truck it is possible to service the galley by means of a ramp extending from the loading facility to the airplane. It is not necessary to have a galley truck. And likewise for toilet facilities on an airplane it is possible to service these from the loading facility and not have a truck for such a chore. In other words, with this loading facility it is possible to eliminate many vehicles moving in the vicinity of the airplane. This lessens the possibility of damaging the airplane by means of the vehicles. To repeat, if an airplane is bumped or damaged by means of a vehicle it is necessary to take the airplane out of service and to take the airplane to the maintenance shops and inspect the airplane and, sometimes, repair the airplane. On a large airplane costing approximately $25,000,000.00 the interest charge in approximately 4 dollars to 5 dollars per minute. From this it is seen that it is desirable to keep the airplane in service as long as possible and with as short maintenance time as possible.

Also, by use of the air dock and the air terminals **470** or **490** fewer people are required to service the airplane. And, there is less turn-around time for the airplane.

Assume that the airplane lands on the air field. Then, the airplane can taxi over to an air dock. The airplane is securely fastened on to the air dock. The air dock is elevated by means of the air cushion so that the air dock is off of the ground. The engines of the airplane are not running. The air dock can be moved either under its own power or moved by means of a tractor or other vehicle to the air terminal. At the air terminal the air dock can be positioned over the lifting device **440** or **444.** The lifting device can elevate the air dock and the airplane to a desired height so that the passengers can unload and baggage can be taken off of the airplane. Then, some of the facilities on the airplane can be checked such as the galley, the baggage and the like. Then, the passengers at the air terminal can be loaded onto the airplane, the airplane lowered on the air dock by means of the lifting devices. If desired the fuel, water and toilet facilities can be checked and replenished at this time. The air dock can be elevated onto the air cushion and moved away from the air terminal and onto the apron. Then, the air cushion and airplane can be moved from the apron to the proximity of the landing strip. Again, the engines of the airplane are not running at this time. There are many advantages to having the engines in a nonoperating condition around the air terminal. Some of these advantages are there is a lower consumption of fuel, less air pollution due to the burning of the jet fuel and airplane fuel, and there is less time logged on the airplane so that more time is used for flying the airplane or a higher percentage of the emgine life of the airplane is used for flying the airplane than when the airplane taxies under its own power from

the apron to the landing strip. The air dock and airplane can move to the landing strip and the airplane can move off of the air dock and onto the area adjacent to the landing strip. When it is approximately the time for the airplane to take off the operator in the control tower can tell the pilot the state of the air field and the pilot can begin to warm the engines for flying the airplane.

Further, if necessary, when the airplane is on the air dock and the air dock is resting on an air cushion the air dock and the airplane can be turned around so that the airplane can rotate in an area the size of its own wing diameter.

From FIGS. **31** through **34** it is seen that the lifting device **440** or **444** and the air dock **40** in conjunction with the air terminal **470** or **490** gives to the airplane, while at the air terminal and in a loading or unloading condition, a three dimensional ability. Prior to this invention airplanes had a two dimensional ability at the air terminal so as to move essentially on the ground. With this invention and air dock and lifting device and air terminal it is possible to move the airplane on the ground and then at the air terminal to elevate the airplane vertically so as to give the airplane a three dimentional ability for ease of loading, unloading, servicing and the like.

Another advantage of the air dock and also of the lifting devices **440** or **444** is the ability to have exact positioning of the airplane with respect to the air terminal every time the airplane is at the air terminal and the loading facilities.

In regard to the maintenance of the airplane if it is desired to repair an airplane the air dock and airplane can be moved to the maintenance area. It is not necessary to have a crew on the airplane to move the airplane, as prior to this invention, from the air terminal to the maintenance facilities. It is possible by means of the air dock and a ground crew, since the engines of the airplane are not operating, to move the airplane from the air terminal to the maintenance facilities. Now, at the maintenace facilities it is possible to more exactly position the airplane in the maintenance facilities for ease of work and for less disturbance while positioning the airplane in the maintenance facilities. In the maintenance facilities, due to the ability to maneuver the air dock while on the air cushion, it is possible to have the airplane at any substantially desired horizontal position.

While the airplane is undergoing normal servicing such as loading and unloading, replenishing the supplies on the airplane, it is possible to de-ice the airplane at the air terminal. It is not necessary to take the airplane away from the air terminal, de-ice the airplane and then bring the airplane back to the air terminal for loading. In colder climates this is desirable. An airplane may pick up considerable weight due to ice on the fuselage and the wings. With the air terminals disclosed in this specification and the air dock and lifting devices it is possible to spray the de-icing solution onto the airplane while the airplane is being loaded and unloaded. This results in a saving of time and also a saving in the movement of the airplane.

In addition to the air dock for riding on an air cushion and for moving loads there is a moving pad comprising one or more primary sections or a combination of one or more primary sections and one or more ramp sections or a combination of one or more primary sections and closure ramps. The primary sections having a self-contained source of compressed gas may be used for moving on an air cushion. Each primary section **42** has the capability of moving approximately 1,000,000 lbs.

With an air dock or a moving pad or various combinations of primary sections and ramps it is possible to move over relatively rough terrain. Each primary section is self contained with respect to an air-tight base and a flexible apron. If there be a plurality of primary sections and the moving pad is moving over rough terrain, such as having variations of eighteen inches in elevation, some of the compressed gas will escape underneath some of the primary sections but will not escape under all of the primary sections, under normal operating conditions. Therefore, those primary sections having an air cushion underneath will have sufficient buoyancy to carry a load. In this manner it is possible to move a moving pad over relatively rough ground or terrain. Now, an advantage of this is that it may be desirable to move a moving pad and a load over a relatively rough terrain without the necessity of building a road. If a road is built it is not necessary to have a road of such high degree of construction that it will support high axle loads. With a moving pad or an air dock the loading is relatively low per unit area. Therefore, a lower quality road can be constructed or an area can be cleared so that a moving pad or an air dock can move over the lower quality road or the cleared area to move a load to a desired location.

I claim:

1. An assembly of a primary section and a ramp section, said assembly comprising:

a. said primary section comprising a structural frame:
b. an air-tight base;
c. an upper surface deck;
d. a first means, free of contact with the surrounding area, for varying the elevation of said section;
e. said ramp section comprising a structural frame;
f. an upper surface deck;
g. a zero side;
h. a connection side;
i. a zero end;
j. a connection end;
k. said connection side being of greater thickness than said zero side;
l. said connection end varying in thickness from said connection side to said zero side;
m. said zero end being of substantially uniform thickness;
n. said connection side, in the vicinity of said zero end, varying in thickness from the average thickness of said connection side to the thickness of said zero end;
o. said zero side being of substantially uniform thickness;
p. means to join said primary section to said ramp section at said connection side; and
g. said first means comprising a source of compressed gas and a controlled release means for said gas for releasing said gas to said air-tight base.

2. An assembly of a primary section and a ramp section, said assembly comprising:

a. said primary section comprising a structural frame;
b. an air-tight base;
c. an upper surface deck;
d. a first means free of contact with the surrounding area, for varying the elevation of said section;

e. said ramp section comprising a structural frame;
f. an upper surface deck;
g. a zero side;
h. a connection side;
i. a zero end;
j. a connection end;
k. said connection side being of greater thickness than said zero side;
l. said connection end varying in thickness from said connection side to said zero side;
m. said zero end being of substantially uniform thickness;
n. said connection side, in the vicinity of said zero end, varying in thickness from the average thickness of said connection side to the thickness of said zero end;
o. said zero side being of substantially uniform thickness;
p. means to join said primary section to said ramp section at said connection side;
q. said air-tight base having a recess in the central part so that the perimeter of the base defines a depending skirt around said recess;
r. a flexible apron positioned in said recess; and,
s. said first means comprising a self-contained source of compressed gas and a controlled release means for said gas for releasing said gas to said recess.

3. An assembly of a primary section and a ramp section, said assembly comprising:
a. said primary section comprising a structural frame;
b. an air-tight base;
c. an upper surface deck;
d. a first means, free of contact with the surrounding area, for varying the elevation of said section;
e. said ramp section comprising a structural frame;
f. an upper surface deck;
g. a zero side;
h. a connection side;
i. a zero end;
j. a connection end;
k. said connection side being of greater thickness than said zero side;
l. said connection end varying in thickness from said connection side to said zero side;
m. said zero end being of substantially uniform thickness;
n. said connection side, in the vicinity of said zero end, varying in thickness from the average thickness of said connection side to the thickness of said zero end;
o. said zero side being of substantially uniform thickness;
p. means to join said primary section to said ramp section at said connection side;
q. said primary section at a second end having a relief ramp;
r. said relief ramp having a surface deck; and,
s. said relief ramp on its underneath part having sound attenuation means.

4. An assembly of a primary section and a ramp section, said assembly comprising:
a. said primary section comprising a structural frame;
b. an air-tight base;
c. an upper surface deck;
d. a first means, free of contact with the surrounding area, for varying the elevation of said section;
e. said ramp section comprising a structural frame;
f. an upper surface deck;
g. a zero side;
h. a connection side;
i. a zero end;
j. a connection end;
k. said connection side being of greater thickness than said zero side;
l. said connection end varying in thickness from said connection side to said zero side;
m. said zero end being of substantially uniform thickness;
n. said connection side, in the vicinity of said zero end, varying in thickness from the average thickness of said connection side to the thickness of said zero end;
o. said zero side being of substantially uniform thickness;
p. means to join said primary section to said ramp section at said connection side;
g. a second means connecting with said ramp section for moving said section.

5. An assembly according to claim **4** and comprising:
a. said second means being a tow socket.

6. An assembly of a primary section and a ramp section, said assembly comprising:
a. said primary section comprising a structural frame;
b. an air-tight base;
c. an upper surface deck;
d. a first means, free of contact with the surrounding area, for varying the elevation of said section;
e. said ramp section comprising a structural frame;
f. an upper surface deck;
g. a zero side;
h. a connection side;
i. a zero end;
j. a connection end;
k. said connection side being of greater thickness than said zero side;
l. said connection end varying in thickness from said connection side to said zero side;
m. said zero end being of substantially uniform thickness;
n. said connection side, in the vicinity of said zero end, varying in thickness from the average thickness of said connection side to the thickness of said zero end;
o. said zero side being of substantially uniform thickness;
p. means to join said primary section to said ramp section at said connection side;
q. a control center for an operator for controlling the direction of movement of said assembly.

7. An air dock comprising a plurality of ramp sections and a plurality of primary sections:
a. each ramp section comprising a structural frame;
b. said ramp section having an upper surface deck secured to said structural frame;
c. a zero side;
d. a connection side;
e. a zero end;
f. a connection end;
g. said connection side being of greater thickness than said zero side;
h. said connection end varying in thickness from said connection side to said zero side;
i. said zero end being of substantially uniform thickness;

j. said connection side, in the vicinity of said zero end, varying in thickness from the average thickness of said connection side to the thickness of said zero end;
k. said zero side being of substantially uniform thickness;
l. means to join said two ramp sections at adjacent said connection ends to form an assembly of ramp sections;
m. each primary section comprising a structural frame;
n. said primary section an air-tight base secured to said frame;
o. an upper surface deck secured to said frame;
p. a first means, free of contact with the surrounding area, for varying the elevation of said section;
q. said primary section having a first side and a second side, an inner end and an outer end;
r. means to join two primary sections at their adjacent inner ends to form an assembly of primary sections; and,
s. means to join said assembly of ramp sections to said assembly of primary sections with the connection sides of said ramp sections joined to first sides and the second sides of said primary sections in said assembly of primary sections to have at least two primary sections joined at their ends and to have ramp sections joined to said primary sections at the sides of the primary sections and with the assembly of primary sections between the assemblies of ramp sections.

8. An air dock according to claim **7** and comprising:
a. a plurality of said assembly of primary sections between said assembly of ramp sections.

9. An air dock according to claim **7** and comprising:
a. said first means comprising a source of compressed gas and controlled release means for said gas for releasing said gas to said air-tight base.

10. An air dock according to claim **9** and comprising:
a. said controlled release means being quick acting for quick cessation of the flow of gas from said source of compressed gas; and,
b. a quick dump means connecting with said air-tight base for allowing the quick release of said gas from said air-tight base.

11. An air dock according to claim **9** and comprising:
a. a first means connecting with the source of compressed gas for controlling the flow of said gas;
b. a second means connecting with said first means for a first reduction in the pressure of said gas;
c. a third means connecting with the second means for a second reduction in the pressure of said gas; and,
d. a fourth means connecting with said third means for controlling the flow of said gas.

12. An air dock according to claim **11** and comprising:
a. a fifth means connecting with said second means and said third means for controlling the flow of said gas.

13. An air dock according to claim **12** and comprising:
a. said fifth means connecting with a quick dump means for allowing the escape of said compressed gas after said compressed gas had flowed past said third means.

14. An air dock according to claim **11** and comprising:
a. said second means results in a first gas at a first pressure;
b. said third means results in a second gas at a second pressure;
c. a sixth means connecting with said fourth means for controlling the flow of said second gas;
d. a seventh means connecting with said first gas at said first pressure for controlling the flow of said first gas; and,
e. said seventh means controls said sixth means for controlling the flow of said second gas.

15. An air dock according to claim **14** and comprising:
a. said sixth means in controlling the flow of said second gas at said second pressure produces a third gas at a third pressure;
b. said seventh means being responsive to the flow of said third gas;
c. said seventh means having a first outlet and a second outlet; and,
d. said seventh means through said first outlet and said second outlet controlling said sixth means.

16. An air dock according to claim **14** and comprising:
a. said fourth means connects with said third means for controlling the flow of said second gas and connects with said second means for controlling the flow of said first gas;
b. said first gas being a control gas and said second gas being the lifting gas; and,
c. said seventh means connects with said fourth means for receiving said first gas.

17. An air dock according to claim **16** and comprising:
a. said seventh means being responsive to the ambient gaseous pressure;
b. said seventh means being responsive to said third gas at said third pressure and to said ambient gaseous pressure to control the flow of gas through said first outlet and said second outlet.

18. An air dock according to claim **11** and comprising:
a. an elevation sensing means for said gaseous lifting means for sensing the elevation of said gaseous lifting means with respect to the underlying surrounding area; and,
b. said elevation sensing means being a transducer for conveying information to the fourth means to control the flow of said gas.

19. An air dock according to claim **11** and comprising:
a. an elevation sensing means for said gaseous lifting means for sensing the elevation of said gaseous lifting means with respect to the underlying surrounding area; and,
b. said elevation sensing means controlling said fourth means for controlling the flow of said second gas.

20. An air dock according to claim **11** and comprising:
a. said second means results in a first gas at a first pressure;
b. said third means results in a second gas at a second pressure;

c. an elevation sensing means for said gaseous lifting means for sensing the elevation of said gaseous lifting means with respect to the underlying surrounding area; and,

d. said elevation sensing means being a transducer for conveying information to the fourth means to control the flow of said second gas.

21. An air dock according to claim **11** and comprising:

a. said second means results in a first gas at a first pressure;

b. said third means results in a second gas at a second pressure;

c. an elevation sensing means for said gaseous lifting means for sensing the elevation of said gaseous lifting means with respect to the underlying surrounding area; and,

d. said elevation sensing means controlling said fourth means for controlling the flow of said second gas.

22. An air dock according to claim **11** and comprising:

a. a fifth means connecting with said second means and said third means for controlling the flow of said gas;

b. said fifth means connecting with a quick dump means for allowing the escape of said compressed gas after said compressed gas had flowed past said third means;

c. an elevation sensing means for said gaseous lifting means for sensing the elevation of said gaseous lifting means with respect to the underlying surrounding area; and,

d. said elevation sensing means being a transducer for conveying information to the fourth means to control the flow of said gas.

23. An air dock according to claim **11** and comprising:

a. a fifth means connecting with said second means and said third means for controlling the flow of said gas;

b. said fifth means connecting with a quick dump means for allowing the escape of said compressed gas after said compressed gas had flowed past said third means;

c. an elevation sensing means for said gaseous lifting means for sensing the elevation of said gaseous lifting means with respect to the underlying surrounding area; and,

d. said elevation sensing means controlling said fourth means for controlling the flow of said second gas.

24. An air dock according to claim **9** and comprising:

a. source of compressed gas being positioned away from said plurality of ramp sections and said plurality of primary sections and connecting with said plurality of primary sections.

25. An air dock according to claim **9** and comprising:

a. said source of compressed gas being a compressor on a mobile support.

26. An air dock according to claim **7** and comprising:

a. said air-tight base having a recess in the central part so that the perimeter of the base defines a depending skirt around said recess;

b. a flexible apron positioned in said recess; and,

c. said first means comprising a self-contained source of compressed gas and a controlled release means for said gas for releasing said gas to said recess.

27. An air dock according to claim **26** and comprising:

a. said flexible apron being hinged to said section;

b. said flexible apron depending from said section;

c. said apron on its lower part having a sealing band for being juxtapositioned with respect to said surrounding area; and,

d. said apron and said sealing band being directed inwardly and into said recess for moving under said section when said section is lowered onto said surrounding area.

28. An air dock according to claim **27** and comprising:

a. said apron being an endless flexible apron.

29. An air dock according to claim **26** and comprising:

a. said controlled release means being quick acting for quick cessation of the flow of gas from said source of compressed gas; and,

b. a quick dump means connecting with said recess for allowing the quick dump of said gas from said recess for the rapid settling of said primary section to the surrounding area.

30. An air dock according to claim **7** and comprising:

a. said section at a second end having a relief ramp;

b. said relief ramp having a surface deck; and,

c. said relief ramp on its underneath part having sound attenuation means.

31. An air dock according to claim **30** and comprising:

a. said controlled release means being quick acting for quick cessation of the flow of gas from said source of compressed gas; and,

b. a quick dump means connecting with said recess for allowing the quick dump of said gas from said recess for the rapid settling of said primary section to the surrounding area.

32. An air dock according to claim **7** and comprising:

a. a second means connecting with said ramp section for moving said section.

33. An air dock according to claim **32** and comprising:

a. said second means being a tow socket.

34. An air dock according to claim **32** and comprising:

a. said second means being a motorized friction drive.

35. An air dock according to claim **34** and comprising:

a. a source of electrical energy;

b. an electrical motor connecting with said source;

c. a ground engaging traction means;

d. said electrical motor connecting with and in driving relation with said ground engaging traction means; and,

e. a third means for varying the elevation of said ground engaging traction means.

36. An air dock according to claim **35** and comprising:

a. said source of electric energy being an electric storage battery;

b. a means for connecting said electric storage battery to an external source of electric energy for charging said electric storage battery; and,

c. a means for connecting said electric storage battery to a user of electrical energy.

37. An air dock according to claim **32** and comprising:

a. a control center for an operator for controlling the horizontal attitude of said air dock.

38. An air dock according to claim **7** and comprising:

a. an electric storage battery;

b. a means for connecting said electric storage battery to an external source of electrical energy for charging said electric storage battery; and

c. a means for connecting said electric storage battery to said first means to operate said first means.

39. An air dock according to claim **7** and comprising:

a. a leveling means for said air dock and comprising:

b. a first level sensing means;

c. a second level sensing means;

d. said air dock comprising a plurality of cells for creating an air cushion; and,

e. said first and second means controlling the flow of air to said cells for controlling the pitch and yaw of said air dock.

40. An air dock according to claim **39** and comprising:

a. said plurality of cells comprising a first cell;

b. a second cell;

c. a third cell;

d. a fourth cell;

e. said first sensing means controlling the flow of air to said first and third cells; and,

f. said second sensing means controlling the flow of air to said second and fourth cells.

41. An air dock according to claim **40** and comprising:

a. said first and second sensing means being at substantially right angles to each other;

b. said first sensing means being on a diagonal between said first and third cells; and,

c. said second sensing means being on a diagonal between said second and fourth cells.

42. An air dock according to claim **40** and comprising:

a. said sensing means comprising single pole double throw mercury switches.

43. An air dock according to claim **41** and comprising:

a. said sensing means comprising single pole double throw mercury switches.

44. An air dock according to claim **7** and comprising:

a. a plurality of said assembly of primary sections between said assembly of ramp sections;

b. said air-tight base having a recess in the central part so that the perimeter of the base defines a depending skirt around said recess;

c. a flexible apron positioned in said recess;

d. said first means comprising a self-contained source of compressed gas and a controlled release means for said gas for releasing said gas to said recess;

e. said flexible apron being hinged to said section;

f. said flexible apron depending from said section;

g. said apron on its lower part having a sealing band for being juxtapositioned with respect to said surrounding area;

h. said apron and said sealing band being directed inwardly and into said recess for moving under said primary section when said primary section is lowered onto said surrounding area;

i. said apron being an endless flexible apron;

j. a second means connecting with said ramp section for moving said section;

k. an electric storage battery;

l. a means for connecting said electric storage battery to an external source of electrical energy for charging said electric storage battery; and,

m. a means for connecting said electric storage battery to said controlled release means.

45. A moving pad, said moving pad comprising:

a. a primary section having a structural frame;

b. an air-tight base secured to said frame;

c. an upper surface deck secured to said frame;

d. said primary section having a first end, a second end, a first side and a second side;

e. a peripheral relief ramp on said primary section and on said first end, said second end, said first side and said second side;

f. said peripheral relief ramp having a surface deck; and,

g. a first means, free of contact with the surrounding area, for varying the elevation of said moving pad.

46. A moving pad according to claim **45** and comprising:

a. said first means comprising a source of compressed gas and a controlled release a means for said gas for releasing said gas to said air-tight base.

47. A moving pad according to claim **46** and comprising:

a. said air-tight base having a recess in the central part so that the perimeter of the base defines a depending skirt around said recess; and,

b. a flexible apron positioned in said recess.

48. A moving pad according to claim **47** and comprising:

a. said flexible apron being hinged to said section;

b. said flexible apron depending from said section;

c. said apron on its lower part having a sealing band for being juxtapositioned with respect to said surrounding area; and,

d. said apron and said sealing band being directed inwardly and into said recess for moving under said section when said section is lowered onto said surrounding area.

49. A moving pad according to claim **48** and comprising:

a. said apron being an endless flexible apron.

50. A moving pad according to claim **46** and comprising:

a. said relief ramp on its underneath part having sound attenuation means.

51. A moving pad according to claim **47** and comprising:

a. said first means comprising a self-contained source of compressed gas and a controlled release means for said gas for releasing said gas to said recess.

52. A moving pad according to claim **51** and comprising:

a. said controlled relrease means being quick acting for quick cessation of the flow of gas from said source of compressed gas; and,

b. a quick dump means connecting with said air-tight base for allowing the quick release of said gas from said air-tight base.

53. A moving pad according to claim **45** and comprising:

a. said first means comprising a source of compressed gas positioned away from said moving pad and connecting with said moving pad.

54. A moving pad according to claim **53** and comprising:

a. said source of compressed gas being a compressor on a mobile support.

55. A moving pad according to claim **45** and comprising:

a. a second means connecting with said moving pad for moving said pad.

56. A moving pad, said moving pad comprising:

a. a plurality of primary sections;

b. said primary section being connected together into an integral unit;

c. said primary section having a structural frame;

d. an air-tight base secured to said frame;

e. an upper surface deck secured to said frame;

f. said primary section having a first end, a second end, a first side and a second side;

g. a peripheral relief ramp on said primary sections and said integral unit;

h. said peripheral relief ramp having a surface deck; and,

i. a first means, free of contact with the surrounding area, for varying the elevation of said moving pad.

57. A moving pad according to claim **56** and comprising:

a. said first means comprising a source of compressed gas and a controlled release means for said gas for releasing said gas to said airtight base.

58. A moving pad according to claim **57** and comprising:

a. said airtight base having a recess in the central part so that the perimeter of the base defines a depending skirt around said recess; and,

b. a flexible apron positioned in said recess.

59. A moving pad according to claim **58** and comprising:

a. said flexible apron being hinged to said section;

b. said flexible apron depending from said section;

c. said apron on its lower part having a sealing band for being juxtapositioned with respect to said surrounding area; and,

d. said apron and said sealing band being directed inwardly and into said recess for moving under said section when said section is lowered onto said surrounding area.

60. A moving pad according to claim **59** and comprising:

a. said apron being an endless flexible apron.

61. A moving pad according to claim **57** and comprising:

a. said relief ramp on its underneath part having sound attenuation means.

62. A moving pad according to claim **58** and comprising:

a. said primary sections being connected in an end to end relationship.

63. A moving pad according to claim **58** and comprising:

a. said primary sections being connected in a side by side relationship.

64. A moving pad according to claim **58** and comprising:

a. said first means comprising a self-contained source of compressed gas and a controlled release means for said gas for releasing said gas to said recess.

65. A moving pad according to claim **62** and comprising:

a. said controlled release means being quick acting for quick cessation of the flow of gas from said source of compressed gas; and,

b. a quick dump means connecting with said airtight base for allowing the quick release of said gas from said airtight base.

66. A moving pad according to claim **56** and comprising:

a. said first means comprising a source of compressed gas positioned away from said moving pad and connecting with said moving pad.

67. A moving pad according to claim **66** and comprising:

a. said source of compressed gas being a compressor on a mobile support.

68. A moving pad according to claim **56** and comprising:

a. a second means connecting with said moving pad for moving said pad.

69. A combination of an air dock and a load, said combination comprising:

a. said air dock comprising a plurality of ramp sections and a plurality of primary sections;

b. each ramp section comprising a structural frame;

c. an upper surface deck secured to said frame;

d. a zero side;

e. a connection side;

f. a zero end;

g. a connection end;

h. said connection side being of greater thickness than said zero side;

i. said connection end varying in thickness from said connection side to said zero side;

j. said zero end being of substantially uniform thickness;

k. said connection side, in the vicinity of said zero end, varying in thickness from the average thickness of said connection side to the thickness of said zero end;

l. said zero side being of substantially uniform thickness;

m. means to join said two ramp sections at adjacent said connection ends to form an assembly of ramp sections;

n. each primary section comprising a structural frame;

o. an airtight base secured to said frame;

p. an upper surface deck secured to said frame;

q. a first means, free of contact with the surrounding area, for varying the elevation of said section;

r. said primary section having a first side and a second side, an inner end and an outer end;

s. means to join two primary sections at their adjacent inner ends to form an assembly of primary sections;

t. means to join said assembly of ramp sections to said assembly of primary sections with the connection sides of said ramp sections joined to first sides and the second sides of said primary sections in said assembly of primary sections to have at least two primary sections joined at their ends and to have ramp sections joined to said primary sections at the sides

of the primary sections and with the assembly of primary sections between the assemblies of ramp sections; and,

u. said load being on said air dock and supported by said air dock.

70. A combination according to claim **69** and comprising

a. said first means comprising a source of compressed gas and a controlled release means for said gas of releasing said gas to said airtight base.

71. An air dock according to claim **70** and comprising:

a source of compressed gas being positioned away from said moving pad and connecting with said moving pad.

72. An air dock according to claim **70** and comprising:

a. said source of compressed gas being a compressor on a mobile support.

73. A combination according to claim **69** and comprising:

a. said airtight base having a recess in the central part so that the perimeter of the base defines a depending skirt around said recess;

b. a flexible apron positioned in said recess; and,

c. said first means comprising a self-contained source of compressed gas and a controlled release means for said gas for releasing said gas to said recess.

74. An air dock according to claim **73** and comprising:

a. said controlled release means being quick acting for quick cessation of the flow of gas from said source of compressed gas; and,

b. a quick dump means connecting with said airtight base for allowing the quick release of said gas from said airtight base.

75. A combination according to claim **69** and comprising:

a. said load being an airplane.

76. A combination according to claim **69** and comprising:

a. an electric storage battery;

b. a means for connecting said electric storage battery to an external source of electrical energy for charging said electric storage battery; and,

c. a means for connecting said electric storage battery to a user of electrical energy.

77. A combination according to claim **69** and comprising:

a. a plurality of said assembly of primary sections between said assembly of ramp sections;

b. said airtight base having a recess in the central part so that the perimeter of the base defines a depending skirt around said recess;

c. a flexible apron positioned in said recess;

d. said first means comprising a self-contained source of compressed gas and a controlled release means for said gas for releasing said gas to said recess;

e. said flexible apron being hinged to said section;

f. said flexible apron depending from said section;

g. said apron on its lower part having a sealing band for being juxtapositioned with respect to said surrounding area;

h. said apron and said sealing band being driected inwardly and into said recess for moving under said section when said section is lowered onto said surrounding area;

i. said apron being an endless flexible apron;

j. a second means connecting with said ramp section for moving said section;

k. an electric storage battery;

l. a means for connecting said electric storage battery to an external source of electrical energy for charging said electric storage battery; and,

m. a means for connecting said electric storage battery to a user of electrical energy.

78. An air dock according to claim **69** and comprising:

a. said primary section at a second end having a relief ramp;

b. said relief ramp having a surface deck; and,

c. said relief ramp on its underneath part having sound attenuation means.

79. An air dock according to claim **77** and comprising:

a. said controlled release means being quick acting for quick cessation of the flow of gas from said source of compressed gas; and,

b. a quick dump means connecting with said recess for allowing the quick dump of said gas from said recess for the rapid settling of said primary section to the surrounding area.

80. An air dock according to claim **69** and comprising:

a. a second means connecting with said ramp section for moving said section.

81. An air dock according to claim **80** and comprising:

a. said second means being a tow socket.

82. An air dock according to claim **80** and comprising:

a. said second means being a motorized friction drive.

83. An air dock according to claim **82** and comprising:

a. a source of electrical energy;

b. an electrical motor connecting with said source;

c. a ground engaging traction means;

d. said electrical motor connecting with an in driving relation with said ground engaging traction means; and,

e. a third means for varying the elevation of said ground engaging traction means.

84. An air dock according to claim **80** and comprising:

a. a control center for an operator for controlling the horizontal attitude of said air dock.

85. An air dock according to claim **69** and comprising:

a. a first means connecting with the source of compressed gas for controlling the flow of said gas;

b. a second means connecting with said first means for a first reduction in the pressure of said gas;

c. a third means connecting with the second means for a second reduction in the pressure of said gas; and,

d. a fourth means connecting with said third means for controlling the flow of said gas.

86. An air dock according to claim **85** and comprising:

a. a fifth means connecting with said second means and said third means for controlling the flow of said gas.

87. An air dock according to claim 86 and comprising:
a. said fifth means connecting with a quick dump means for allowing the escape of said compressed gas after said compressed gas has flowed past said third means.

88. An air dock according to claim 85 and comprising:
a. said second means results in a first gas at a first pressure;
b. said third means results in a second gas at a second pressure;
c. a sixth means connecting with said fourth means for controlling the flow of said second gas;
d. a seventh means connecting with said first gas at said first pressure of controlling the flow of said first gas; and,
e. said seventh means controls said sixth means for controlling the flow of said second gas.

89. An air dock according to claim 88 and comprising:
a. said sixth means in controlling the flow of said second gas at said second pressure produces a third gas at a third pressure;
b. said seventh means being responsive to the flow of said third gas;
c. said seventh means having a first outlet and a second outlet; and,
d. said seventh means through said first outlet and said second outlet controlling said sixth means.

90. An air dock according to claim 88 and comprising:
a. said fourth means connects with said third means for controlling the flow of said second gas and connects with said second means for controlling the flow of said first gas;
b. said first gas being a control gas and said second gas being the lifting gas; and,
c. said seventh means connects with said fourth means for receiving said first gas.

91. An air dock according to claim 90 and comprising:
a. said seventh means being responsive to the ambient gaseous pressure; and,
b. said seventh means being responsive to said third gas at said third pressure and to said ambient gaseous pressure to control the flow of gas through said first outlet and said second outlet.

92. An air dock according to claim 91 and comprising:
a. said sixth means being a pneumatic vortex amplifier; and,
b. said seventh means being a pneumatic mono-stable proportional amplifier.

93. An air dock according to claim 85 and comprising:
a. an elevation sensing means for said gaseous lifting means for sensing the elevation of said gaseous lifting means with respect to the underlying surrounding area; and,
b. said elevation sensing means being a transducer for conveying information to the fourth means to control the flow of said gas.

94. An air dock according to claim 85 and comprising:
a. an elevation sensing means for said gaseous lifting means for sensing the elevation of said gaseous lifting means with respect to the underlying surrounding area; and,
b. said elevation sensing means controlling said fourth means for controlling the flow of said second gas.

95. An air dock according to claim 85 and comprising:
a. said second means results in a first gas at a first pressure;
b. said third means results in a second gas at a second pressure;
c. an elevation sensing means for said gaseous lifting means for sensing the elevation of said gaseous lifting means with respect to the underlying surrounding area; and,
d. said elevation sensing means being a transducer for conveying information to the fourth means to control the flow of said second gas.

96. An air dock according to claim 85 and comprising:
a. said second means results in a first gas at a first pressure;
b. said third means results in a second gas at a second pressure;
c. an elevation sensing means for said gaseous lifting means for sensing the elevation of said gaseous lifting means with respect to the underlying surrounding area; and,
d. said elevation sensing means controlling said fourth means for controlling the flow of said second gas.

97. An air dock according to claim 85 and comprising:
a. a fifth means connecting with said second means and said third means for controlling the flow of said gas;
b. said fifth means connecting with a quick dump means for allowing the escape of said compressed gas after said compressed gas had flowed past said third means;
c. an elevation sensing means for said gaseous lifting means for sensing the elevation of said gaseous lifting means with respect to the underlying surrounding area; and,
d. said elevation sensing means being a transducer for conveying information to the fourth means to control the flow of said gas.

98. An air dock according to claim 85 and comprising:
a. a fifth means connecting with said second means and said third means for controlling the flow of said gas;
b. said fifth means connecting with a quick dump means for allowing the escape of said compressed gas after said compressed gas has flowed past said third means;
c. an elevation sensing means for said gaseous lifting means for sensing the elevation of said gaseous lifting means with respect to the underlying surrounding area; and,
d. said elevation sensing means controlling said fourth means for controlling the flow of said second gas.

99. An air dock according to claim 69 and comprising:
a. a leveling means for said air dock and comprising:
b. a first level sensing means;

c. a second level sensing means;
d. said air dock comprising a plurality of cells for creating said air cushion; and,
e. said first and second means controlling the flow of air to said cells for controlling the pitch and yaw of said air dock.

100. An air dock according to claim **99** and comprising:
a. a first cells;
b. a second cell;
c. a third cell;
d. a fourth cell;
e. said first sensing means controlling the flow of air to said first and third cells; and,
f. said second sensing means controlling the flow of air to said second and fourth cells.

101. An air dock according to claim **100** and comprising:
a. said first and second sensing means being at substantially right angles to each other;
b. said first sensing means being on a diagonal between said first and third cells; and,
C. said second sensing means being on a diagonal between said second and fourth cells.

102. An air dock according to claim **100** and comprising:
a. said sensing means comprising single pole double throw mercury switches.

103. An air dock according to claim **101** and comprising:
a. said sensing means comprising single pole double throw mercury switches.

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