PUBLISHED
MAY 25, 1943.
BY A. P. C.

D. A. APOSTOLOU
DEVICE FOR NEUTRALIZING THE INERTIA OF A VEHICLE BODY
Filed July 31, 1941

Serial No.
404,951

6 Sheets-Sheet 1

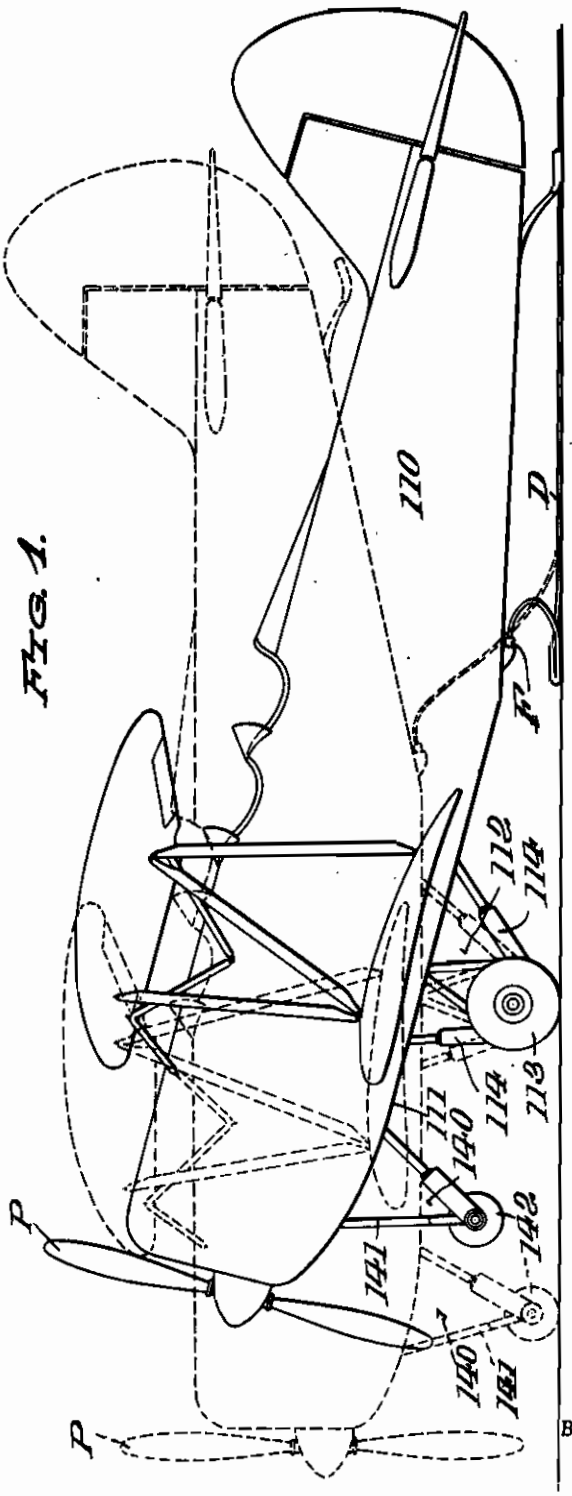

FIG. 1.

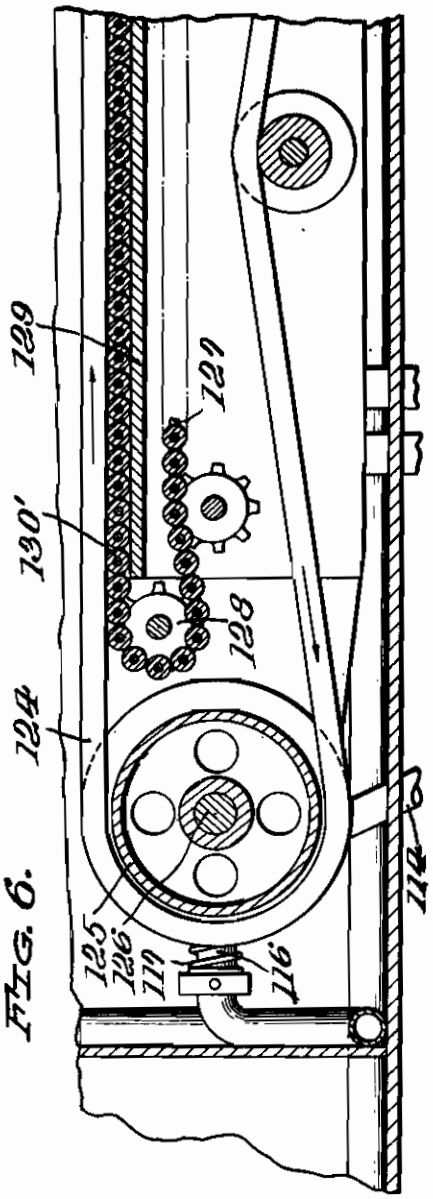

FIG. 6.

INVENTOR.
D. A. Apostolou
BY C. F. Wenderoth
ATTORNEY.

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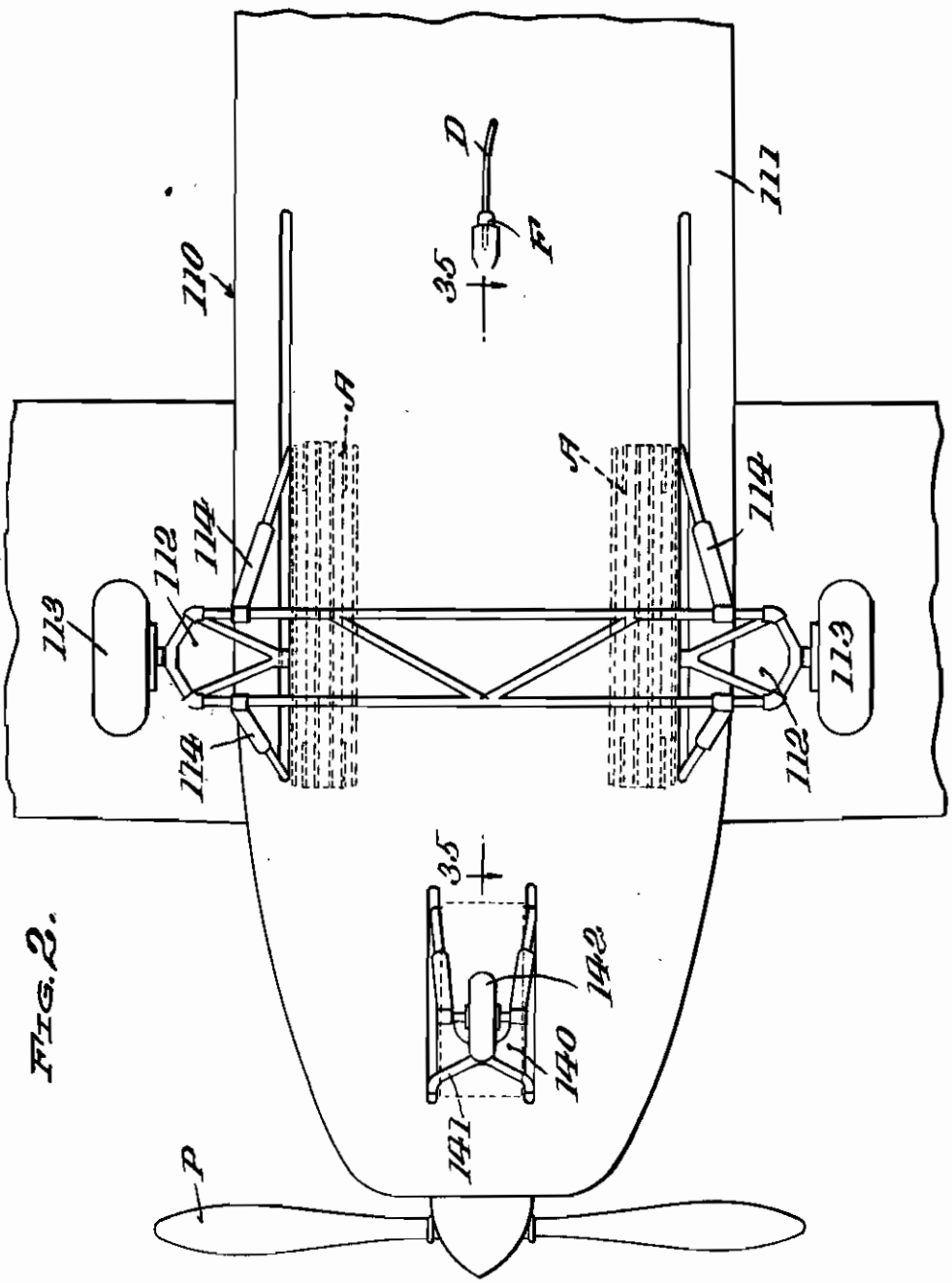

FIG. 2.

INVENTOR.
D. A. Apostolou
BY C. F. Wunderoth
ATTORNEY.

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6 Sheets-Sheet 3

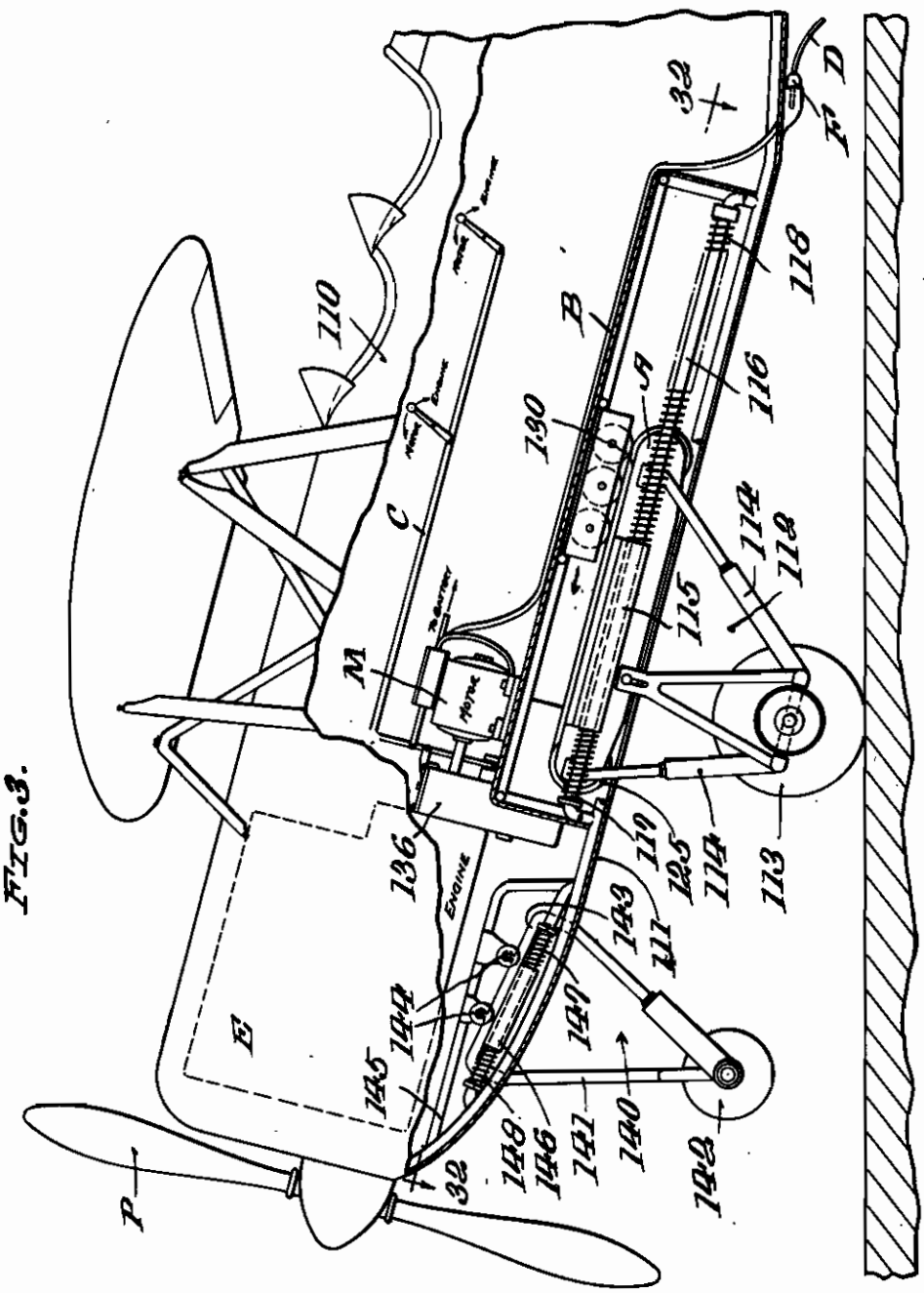

FIG. 3.

INVENTOR.

D. A. Apostolou

BY C. F. Wenderoth

ATTORNEY.

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BY A. P. C.

D. A. APOSTOLOU

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6 Sheets-Sheet 4

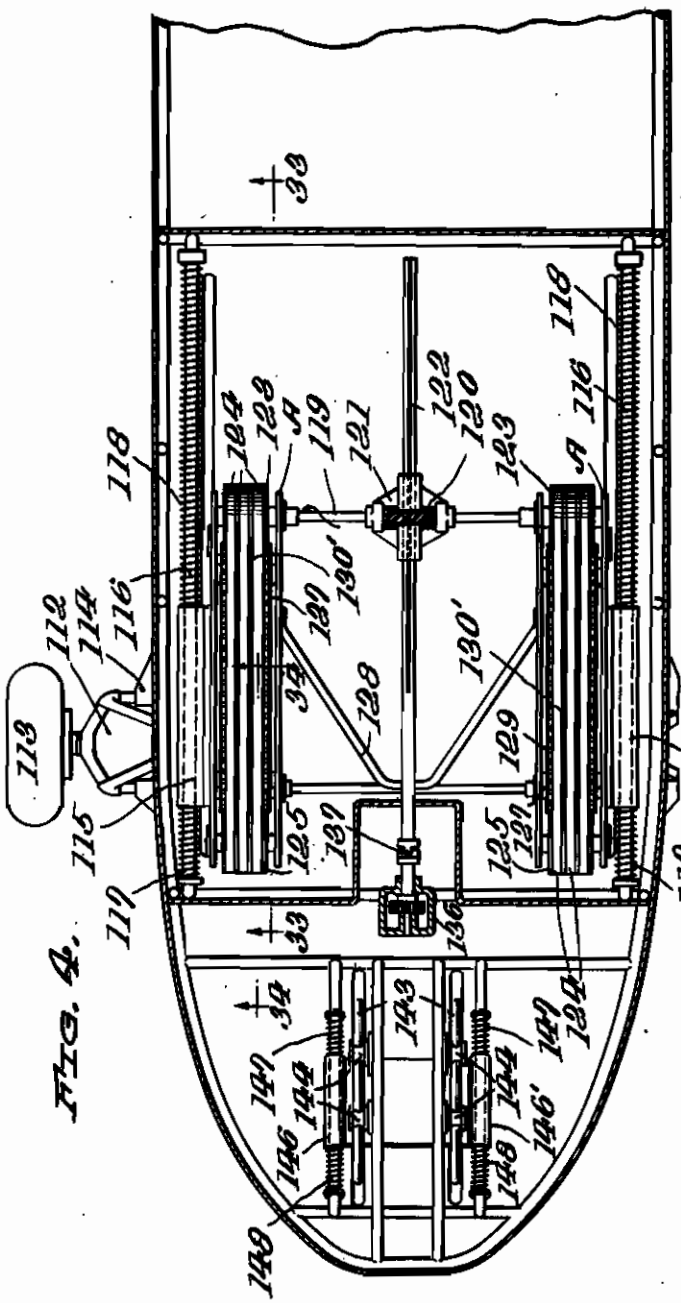

Fig. 4.

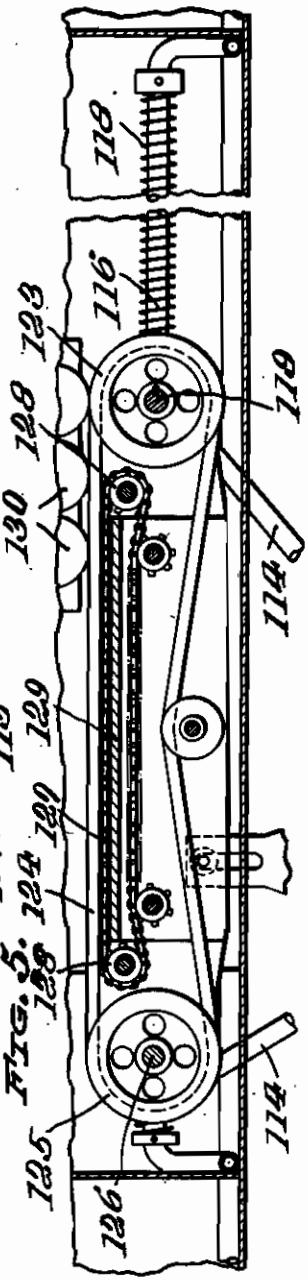

Fig. 5.

INVENTOR.

D. A. Apostolou

BY C. F. Wenderoth

ATTORNEY.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

D. A. APOSTOLOU

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6 Sheets—Sheet 5

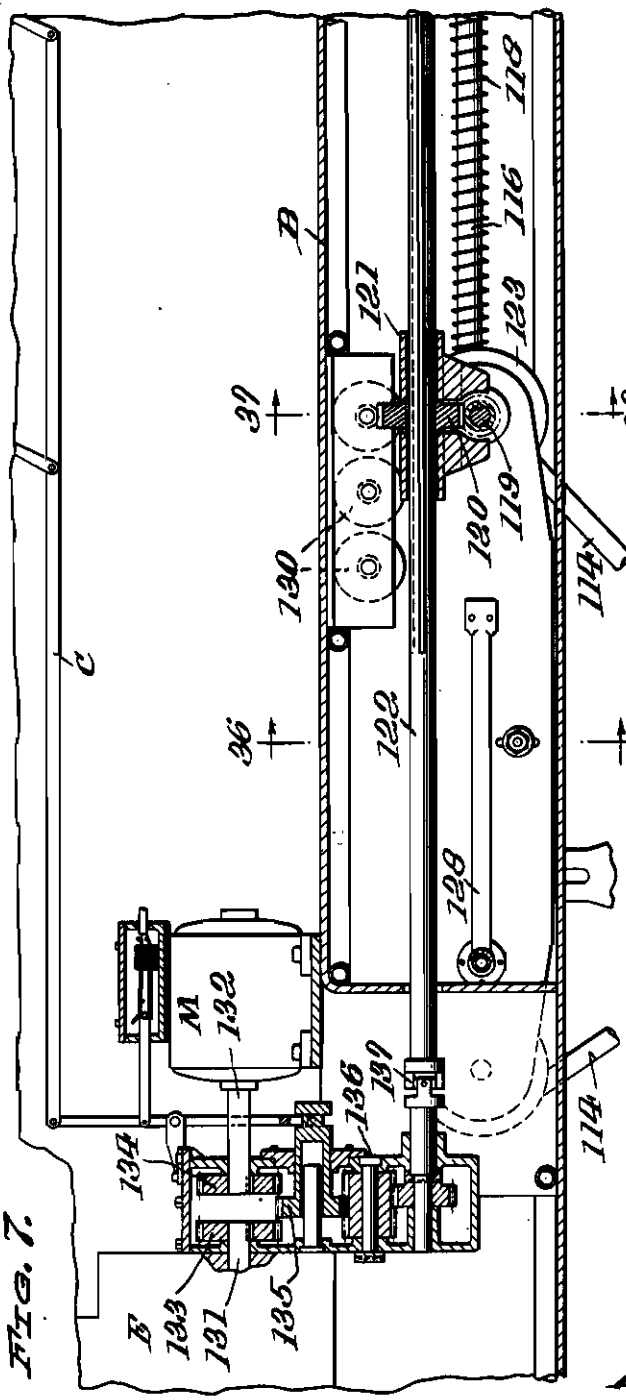

FIG. 7.

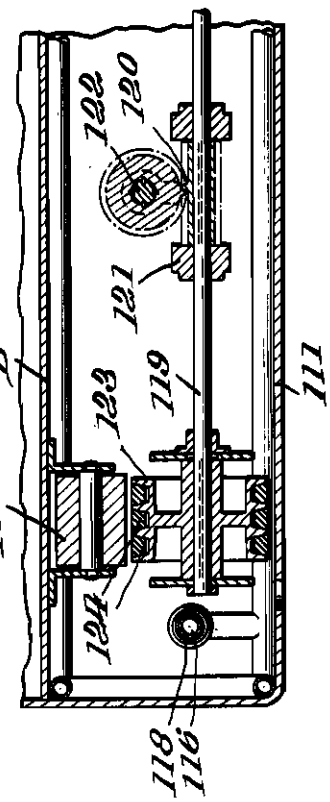

FIG. 9.

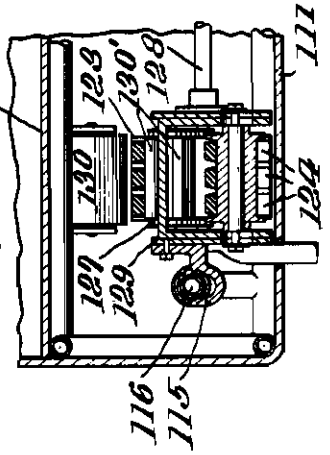

FIG. 8.

INVENTOR.

D. A. Apostolou

BY C. F. Wenderoth

ATTORNEY.

PUBLISHED
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BY A. P. C.

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FIG. 10.

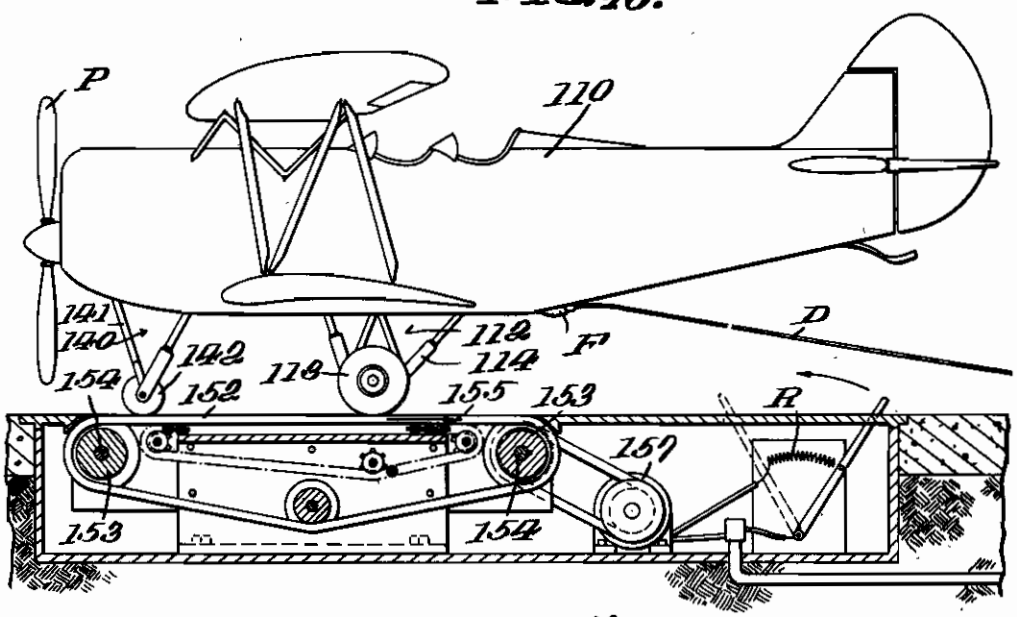
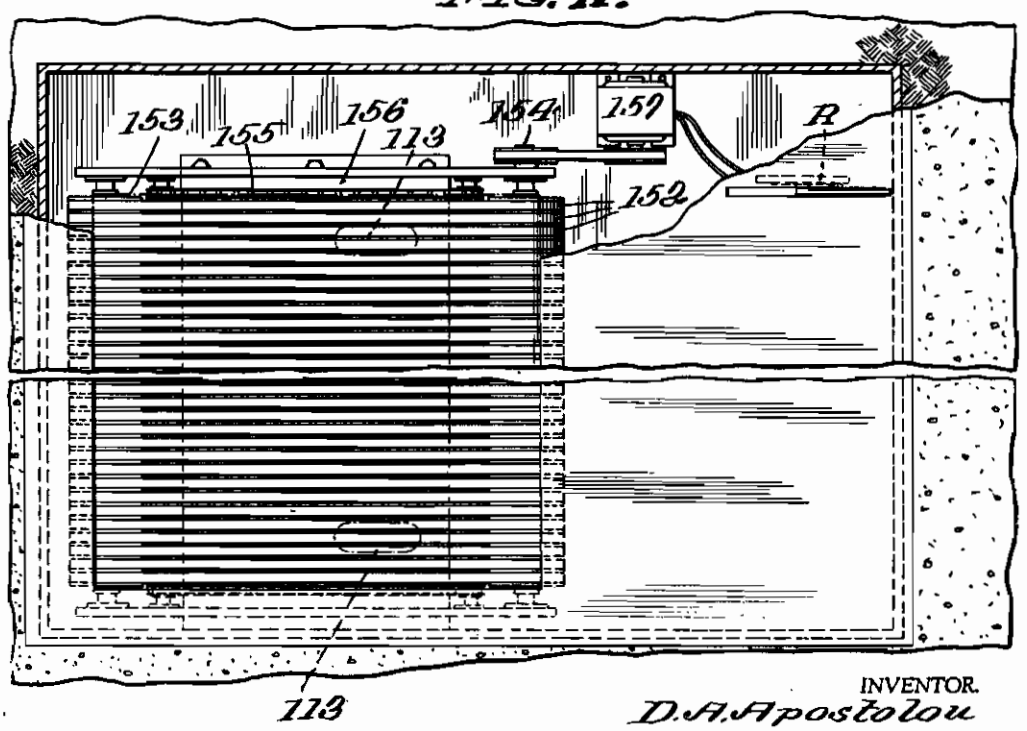


FIG. 11.



INVENTOR.
D. A. Apostolou
BY C. F. Wenderoth
ATTORNEY.

Published May 25, 1943

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ALIEN PROPERTY CUSTODIAN

DEVICE FOR NEUTRALIZING THE INERTIA OF A VEHICLE BODY

Demeter A. Apostolou, Athens, Greece; vested in the Alien Property Custodian

Application filed July 31, 1941

This application is a division of my application Serial Number 288,214, filed August 3, 1939.

The chief object of this invention is to provide a device for neutralizing acquired speed or momentum in order to avoid harmful or undesired consequences of such speed or momentum, for example, such as arise in the event of sudden reduction of speed or sudden stopping of moving masses such as motor vehicles, engines, cars, airplanes, etc.

This neutralization applies not only to the vehicular or other mass as a unit, but also to any mass being carried upon such unit or within it, as for example loose goods, baggage, and passengers, as well as being applicable to trailers and other connected trains of vehicles.

By this invention, the harmful consequences which naturally follow an abrupt reduction in speed are automatically eliminated regardless of the suddenness of slowing down or stopping. A motor car, for instance, running at its maximum speed (100–150 km. per hour or faster) can be stopped as abruptly as its brakes will permit, without any disturbing or harmful shock to passengers or injury and destruction to itself or goods being carried upon it, in the manner hereafter explained.

The theory upon which the present invention proceeds is the following:

Assume a certain mass to be moving upon a moving surface (belt)—the mass traveling in one direction while the surface on which it is running is traveling in the opposite direction. Now, when the relative speeds of the moving mass and the moving surface are so synchronized that they are equal, but in opposite directions, the moving mass will appear to a stationary observer to be at a standstill. In the same manner, the freight or passengers being carried upon a mass moving as described,—notwithstanding the fact that said freight or passengers have a speed corresponding to the acquired speed of the moving mass,—will not exhibit as regards the stationary surroundings any of the consequences of inertia, in view of the apparent immobility of the mass, so long as its forward momentum becomes neutralized by the surface upon which it is running, said surface moving in the opposite direction with an equal power and speed.

Now, to place beneath the wheels of a moving mass or a mass moving on rails, a surface moving in the opposite direction, at a time when it would be desired to offset the effects of acquired speed and inertia, is not only impractical but, even if practically possible, would bring results directly contrary to those aimed at; for it would be most undesirable to bring abruptly into frictional contact two powerful forces moving at fast speeds in opposite directions. Before the desired synchronization would be effected, there would occur a violent shock with injurious consequences.

However, by the present invention as hereinafter explained, it becomes possible to neutralize, completely and without danger, the consequences of acquired speed and inertia, basing the invention on the theory above described; because the oppositely moving surface is already installed between the mass whose momentum is to be affected, and the chassis upon which said mass is mounted, as will be explained in connection with the drawings.

In short, then, the general object of this invention is the elimination of accidents in connection with any type of vehicle, inasmuch as it makes possible the most complete and abrupt braking without danger of destruction or injury to the moving mass or the freight being carried, and without danger of death or injury to passengers. It also becomes possible to prevent striking any obstacles or pedestrians.

A collateral object of the invention is to make possible the landing of an airplane in an extremely short distance after the wheels touch ground, for it enables the most complete braking of the plane's wheels without danger of the overturning of the plane. It also enables a plane to take off in a short distance as will be explained hereinafter.

With the foregoing objects in view, the invention comprises a moving surface or belt moving in a direction opposite to that in which the vehicle is proceeding. Said surface is placed between the chassis of the vehicle and its body,—the body being the mass whose acquired speed and inertia is to be neutralized. As applied to an airplane, the moving surface is placed between the undercarriage and the body of the plane.

Beneath the body of the vehicle or the airplane I attach sets of small wheels and when the body of the vehicle or plane, after sharp braking, tends to roll forward even slightly on small rollers which are placed between the chassis and the body, these sets of small wheels come upon the above-mentioned moving surface which is moving in the opposite direction. When those small wheels come into contact with the oppositely moving surface and roll upon it, the body or mass ceases its tendency to surge forward, because this forward motion is smoothly absorbed

or neutralized by the action of the oppositely moving surface.

To give a particular example, consider the application of the invention to an automobile—with the sudden braking of the car, only the chassis and engine, including the radiator and transmission system, are abruptly halted; the body and its appurtenances, including fenders, engine and radiator covers, are allowed to surge forward slightly, (by means of the above-mentioned rollers) so that this weight, including any passengers or freight that may be thereon or therein, is taken up from the oppositely moving surface through the small sets of wheels. As the rapidly moving surface receives the weight of the body, its opposite action neutralizes or absorbs the forward running of the body—that is, although the body is still presumably rolling forward, the oppositely running surface prevents the body of thc car from gaining any ground, for this oppositely moving surface has the tendency to push and carry the weight back so that, when there is the necessary synchronization, depending on the rapidity of the moving surface in relation to the traveling speed of the vehicle, there immediately occurs complete neutralization of the acquired speed and momentum, without any danger to the vehicle, or its passengers or freight. The synchronization referred to above may be aided and made faster and better by light spring action between the chassis and body as hereinafter explained.

It may be noted that, in view of the rollers referred to above, it will not be necessary for the oppositely moving surface to bear the entire weight of the body, for a good proportion of the weight towards the rear of the body will be carried upon these rollers, and only the forward weight of the body will come to bear on the oppositely moving surface.

The power necessary to activate the oppositely moving surface may be derived from the engine of the vehicle. Thus, immediately upon the application of the brakes, all the engine's power is available for the working of the moving surface. However, various other activating forces such as compressed air or any other type of force independent of the force which drives the vehicle may be used for driving the moving surface. If the power is taken from the driving engine of the vehicle, the necessary amount is negligible and in no way detracts from the needed power for forward drive.

It is also a feature of the invention that means will be provided whereby on the one hand, the chassis and body may be automatically joined and held rigidly together during normal driving, and, on the other hand, whereby there may be effeeted the automatic release of the body (which will tend to surge forward and be carried upon the moving surface), from the chassis (which will remain absolutely stationary) on sharp emergency braking.

With reference to the application of the invention to an airplane, for landing purposes, the object and nature of the invention are the same as in all other vehicles in general; there is provided however an additional landing wheel to be placed toward the nose of the plane (or any other equivalent provision) so that the shift in the center of weight of the mass may be neutralized, and danger of overturning avoided, when the loose-moving body of the plane surges forward ahead of the undercarriage. The system of oppositely moving surface belts, comprising this invention, will be installed between the undercarriage and the body of the airplane, with the moving surfaces attached to the undercarriage, and the small sets of wheels to carry the body of the plane upon these running surfaces attached to the underside of the body.

In addition, it is necessary for the undercarriage, including this forward additional wheel, to be installed on a type of chassis upon which the body of the airplane will rest. The body of the plane can be fastened to, or loosened from, this chassis at the proper time and manner as was above described for the other types of vehicles. All the other provisions as to attachment and operation are exactly the same as described for the other vehicles.

There will be hook attachments to effect the automatic and rigid holding together of body and carriage at the proper times, and also to effect the immediate release of these two elements, exactly as provided for in the application of the invention to automobiles and other vehicles.

As concerns the taking off of an airplane with a view to avoiding the necessity of using a long distance for the take-off, the invention itself accomplishes a result which, though somewhat different from the embodiment of the invention as applied to vehicles, nevertheless is a result inherent in the very nature of the invention as described above. In other words, whereas, in landing, the invention is utilized to accomplish the neutralization of momentum and inertia and thus make possible the stopping of the airplane quickly and safely, in taking off, the invention allows the mass to accumulate an immense power of energy and forward motion, the while keeping the airplane motionless; this developed momentum is at the proper moment set free by relaxing the action of the oppositely moving surface and the airplane smoothly assumes a high speed.

It is well to explain at this point exactly how the invention would be applied in connection with the take-off of airplanes. When, by the use of any feasible method, we prevent the forward motion of the undercarriage, and allow the motor to run and the propellers to turn, the body of the plane will tend to surge forward (rolling on the small rollers placed between undercarriage and body), and will be carried forward onto the oppositely moving surface by the small sets of wheels attached to the body. So long as the propellers continue to turn, these small wheels keep turning in the direction the plane is facing, but the action of the oppositely moving surfaces prevents the body of the plane from moving forward in respect to the ground, while the speed of the moving surfaces is maintained at the proper ratio to the speed of the small wheels. When the body of the plane, now running upon the moving surface, attains the desired speed and momentum, the action of these surfaces is relaxed and at the same time the undercarriage is freed so that the plane may roll forward. The body will then pull the undercarriage rapidly forward and the plane will continue its forward progress running along the ground with a speed corresponding to the running speed or momentum it aequired while still running on the moving surfaces.

In accordance with another aspect of the invention the moving surface could be provided at a landing field or in the deek of an airplane carrier and then an airplane without any speeial structural features could land in a relatively small space, the tendency of the airplane to continue along the ground or deck being neutralized

by the oppositely moving surface in accordance with my invention.

It may be added that also in accordance with the present invention there may be achieved the speedy and opportune stopping of a vehicle or train of connected cars independently of a driver's particular ability or capacity, in a certain situation, to apply the brakes. According to this aspect of the invention, the automatic stopping of a vehicle or train of connected cars is accomplished by a special fender or bumper which can be placed at the front end of the vehicle, or of each car in a train, which bumper can act instantaneously on the brakes, directly such bumper receives a sufficient specified pressure to force it backwards. The sudden stop achieved in this manner will not have harmful consequences due to the provision of the neutralizing device of the invention.

Finally, with reference to the particular aspect of the invention set forth in the previous paragraph, and also with reference to the invention generally, there may be provision for effecting braking of a vehicle or train of vehicles without the usual slipping of the wheels; this is accomplished by the provision of chucks or any other type of wedge, which can be automatically inserted and withdrawn, at the proper time and in the proper manner, between the front end of the wheels and the road surface or trail rails.

One of the principal features of the invention resides in an airplane wherein a forward propelling force or inertia may be built up in the fuselage of the airplane to assist in taking off from the ground and also to arrest forward inertia of the airplane when landing.

With the above and other objects in view which will appear from the detailed description below the invention is shown as applied particularly to an automobile and an airplane. It is obvious that the invention is capable of many embodiments and the drawings show only a preferred method of construction.

Referring to the drawings:

Fig. 1 is a side elevational view of my improved airplane, the same being shown in a normal position in full lines and in a forwardly tilted taking off position in dotted lines.

Fig. 2 is a fragmentary bottom plan view.

Fig. 3 is an enlarged fragmentary side elevational view with parts broken away in section.

Fig. 4 is a horizontal sectional view on the section line **32—32** of Figure 3.

Fig. 5 is an enlarged detail vertical longitudinal sectional view on the section line **33—33** of Figure 4.

Fig. 6 is an enlarged vertical longitudinal sectional view on the section line **34—34** of Figure 4.

Fig. 7 is an enlarged vertical longitudinal view on the section line **35—35** of Figure 2.

Fig. 8 is a detail vertical transverse sectional view on the section line **36—36** of Figure 7.

Fig. 9 is a detail vertical transverse sectional view on the section line **37—37** of Figure 7.

Fig. 10 is a vertical longitudinal sectional view through a tread-mill device showing my improved airplane positioned thereon for taking off.

Fig. 11 is a top plan view with parts broken away in section of the tread-mill device illustrated in Fig. 10.

The invention, as applied to an airplane, will now be described and in the different figures similar reference characters are used for like elements.

The numeral **110** designates a fuselage of the improved airplane which includes an inner frame structure **111** which is free of the main landing gear **112**. The landing gear **112** includes the usual pair of opposed wheels **113—113** and upwardly diverging shock absorbing struts **114—114** at opposite sides of the landing gear structure. The struts **114—114** extend into the fuselage and are fixedly connected to a frame structure, which frame structure includes bearings **115—115** which are slidably mounted on rods **116—116** extending lengthwise of the fuselage and secured at their ends to the frame structure **111**. Equalizing springs **117** and **118** respectively abut the opposite ends of each bearing **115** and the other ends abut collars fixedly secured to the rods **116**. Thus it will be seen that the landing gear **112** is slidably connected to the rods **116—116** for back and forth sliding movement. As previously mentioned, the bearings **115—115** are fixedly secured to a frame or carriage disposed adjacent the sides of the fuselage and each frame or carriage is designated by the letter A. A transverse drive shaft **119** has its ends journaled in the two frames or carriage structures A—A and this shaft is driven by gearing **120** carried by a frame **121** splined to and slidable longitudinally upon a drive shaft **122**. Fixed to the shaft **119** and disposed within the frame structures A—A are pulley wheels **123** over which belts **124** pass, the said belts also passing over pulley wheels **125** rotatably carried by shaft **126** mounted in the forward ends of the frames A—A. Underlying the top leads of the endless belts **124** is the top lead of a plurality of chains **127** which pass over sprocket wheels **128**. A platform **129** underlies the top lead of each set of chains and each chain is provided with a plurality of closely spaced anti-friction rollers **138'** with which the top lead of the endless belt **124** engage.

The aforementioned chains, belts, driving pulleys, and sprockets, are enclosed in a housing B which is integral with the fusclage **110** and fixedly mounted to the housing B directly above each set of driven endless belts **124** are a set of three rollers **130**, the said rollers being normally out of riding engagement with the belts **124** when the weight of the airplane is off the ground for there is a slight vertical movement between the landing gear **112** and the frames A—A.

The endless belts **124** are adapted to be driven in unison in the direction of the arrows shown in Figure 3, that is the movement of the top lead of the belts is in a forward direction and in view of the fact that the body or fuselage of the airplane is supported on the belt by the engagement of the rollers **130** therewith, there will be a tendency for the entire body or fuselage to shift forward relative to the landing gear. The power for imparting movement to the belts may either be through the engine E of the airplane or by means of an auxiliary electric motor M which is mounted rearwardly of the engine and upon the housing B (see Figures 3 and 7), the shaft **131** of the engine E is in axial alinement with the driving shaft **132** of the electric motor M and these shafts carry driving gears **133** and **134** respectively, either of which may be brought into meshing engagement with a gear **135** forming part of a gear transmission **136** wnich connects either of the driving shafts **131** and **132** with the longitudinally extending shaft **122**, the latter having the universal joint **137** therein due to the fact that the frames A—A have a slight vertical up and down movement. Any conventional manual control such as shown in Figure 3 of the drawing and designated C may

be employed for selective shifting either of the gears 133 and 134 into engagement with the gear 135, depending upon whether the power for the shaft 122 is to come from the engine E, or from the auxiliary motor M. When the engine E is used as a source of power from the shaft 122 and the plane is at rest, the pitch of the variable propeller P may be adjusted to zero so that the propeller may rotate without exerting a forward propelling movement. When the motor M is resorted to as a source of power for the rotation of the shaft 122, the same may receive its electricity from a cable D which is releasably connected by a plug and socket connection F, and which connection is broken when the forwardly moving plane reaches the length of the electric supply cable D.

Mounted forwardly of the main landing gear 112 is an auxiliary landing gear 140, the same including a frame 141 having a landing wheel 142 mounted on the outer end thereof. The inner end of the frame 141 includes a pair of inclined rails 143 over which sets of rollers 144 ride, the said rollers being carried by a frame 145 forming part of the frame structure 111 of the fuselage. The frame 141 is provided with a pair of bearings 146 which slide on rods 147 extending lengthwise of the fuselage and which rods are fixed to the frame structure 111. Equalizing springs 148 engage the ends of the bearings 146 and collars fixed on the rods 147. The springs 146 normally hold the landing gear 140 in the position shown in Figure 3 of the drawings, but this landing gear permits the fuselage to shift forward when the wheel 142 is upon the ground, as illustrated in dotted lines in Figure 1 of the drawings. The airplane assumes this forwardly tilted position after either the motor M or the engine E has been thrown into operation to drive the endless belts 124, it being remembered that at that time the friction between the belts and the rollers 130 causes the fuselage to shift relative to the landing gear 112 and in the shifting, the forward end of the airplane is overbalanced, at which time the auxiliary landing gear 140 touches the ground and the fuselage is permitted to shift relative to the landing gear 140 by reason of the rollers 144 and track rails 143.

It will be seen that if the brakes are applied to the wheels 113 of the main landing gear or if the wheels are forwardly chucked, momentum may be stored up in the fuselage of the airplane prior to taking off and which force acts to facilitate the ready ascent of the airplane when the brakes are released and the pitch of the variable propeller P is adjusted for flying condition.

When landing, it will be seen that the motor M or engine E may be operatively connected with the shaft 122 for driving the endless belt 124 and as the wheels of the landing gear touch the ground, the moving belts and rollers 130 coact to resist any forward thrusts or inertia which may be present in the body of the airplane, thus permitting the plane to land without undue shock to the plane and its occupants.

In Figures 10 and 11 of the drawings, I have illustrated the take off platform for an airplane constructed in accordance with that hereinbefore described. In these figures, a platform 150 is countersunk in the ground or runway and mounted in a portion of the platform is a tread mill 151 on which the wheels of the landing gear of the airplane rest preparatory to taking off. The tread mill includes a series of driven endless belts 152, the top lead of which travels in the direction of the arrows shown in Figure 10 and which belts pass over pulleys 153 mounted on shafts 154. Underlying the top lead of the belts 152 are chains 155 similar to the chains 127 hereinbefore mentioned and which chains ride over a platform 156. One of the shafts 154 is driven through a belt and pulley connection by an electric motor 157 and this motor is controlled by a hand operated rheostat R. It will be seen that when the airplane is rolled upon the tread mill 151 and the inertia devices within the airplane have been operated to cause the auxiliary landing gear 140 to move down, the tread mill 151 may be started and the variable propeller B adjusted for taking off and the movement of the tread mill counteracts the normal tendency of the airplane to travel forwardly, until such time that the propeller has reached a speed sufficient to impart a lifting of the airplane, at which time the tread mill 151 is shut off and the airplane is then free to move forwardly and rapidly rise in the air.

While the invention has been described above with reference to an airplane, it is obvious that the invention is capable of general application.

DEMETER A. APOSTOLOU.