Aug. 25, 1936. C. DORNIER 2,052,086

FLYING MACHINE

Filed Jan. 10, 1934 3 Sheets-Sheet 1

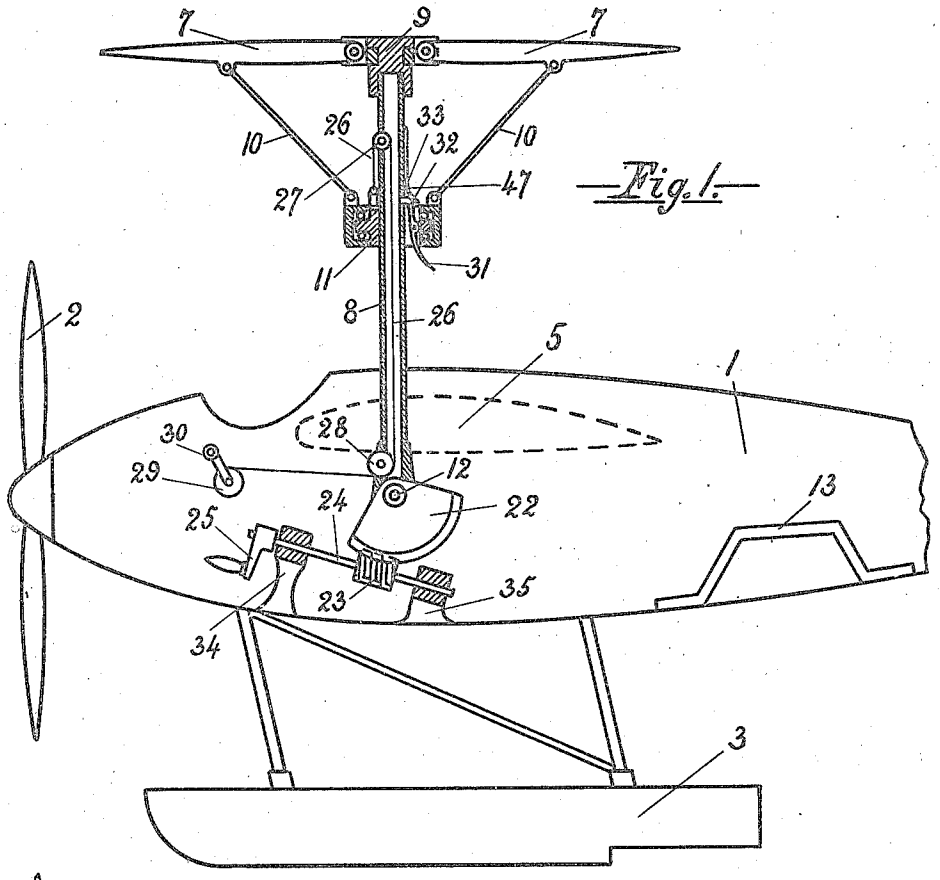


Fig. 1.

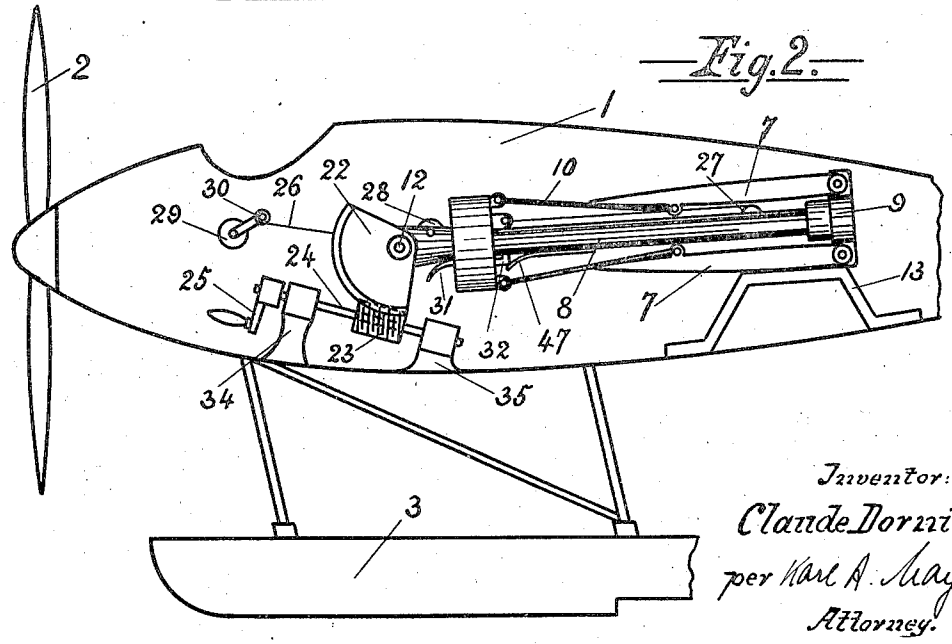


Fig. 2.

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Fig. 3.

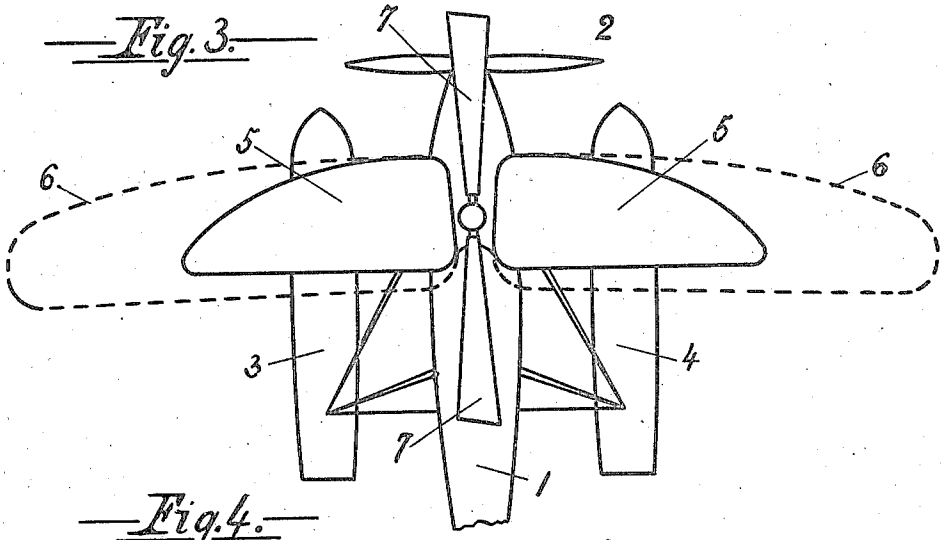


Fig. 4.

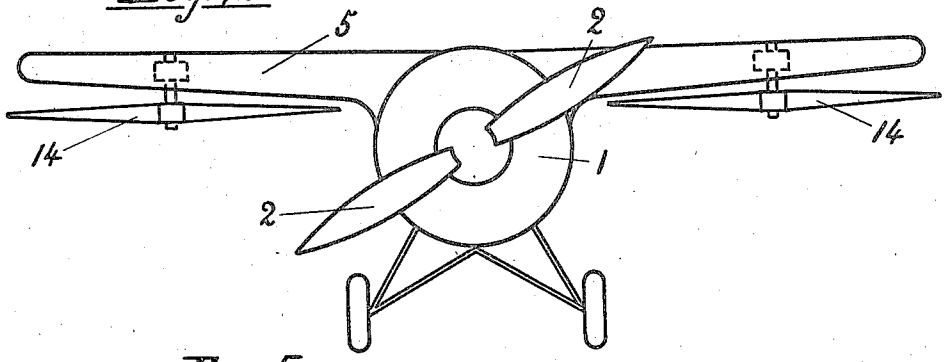
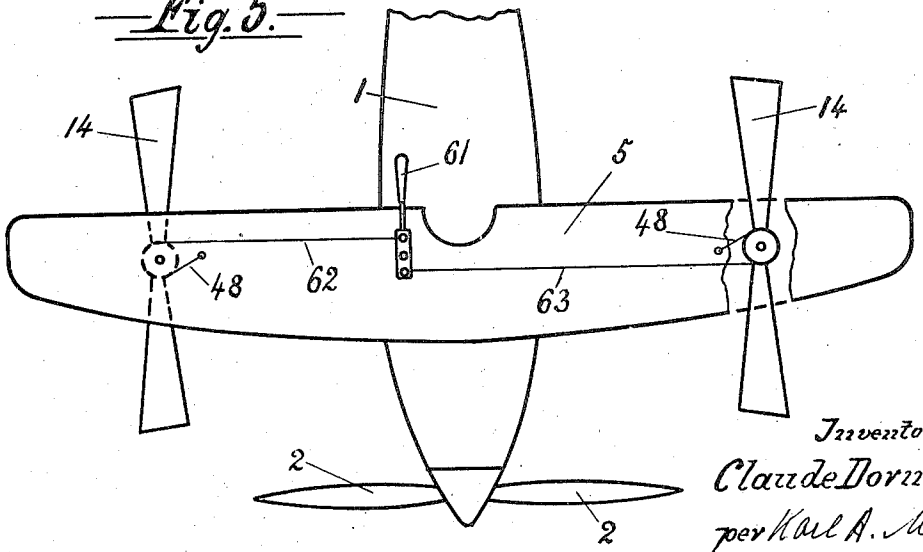


Fig. 5.



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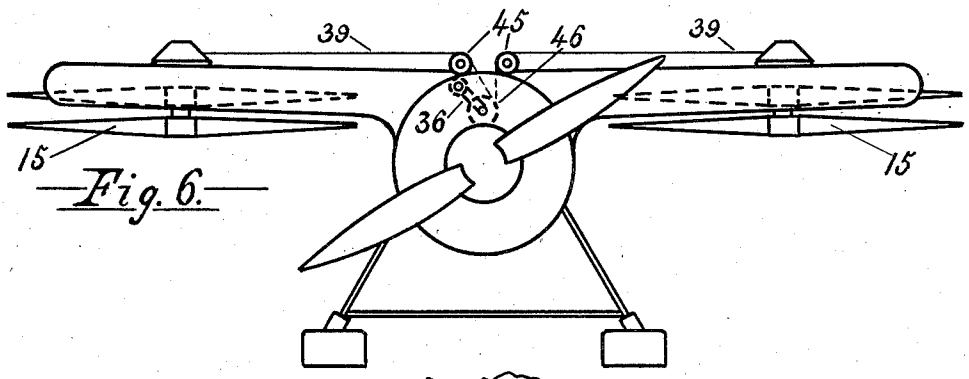


Fig. 6.

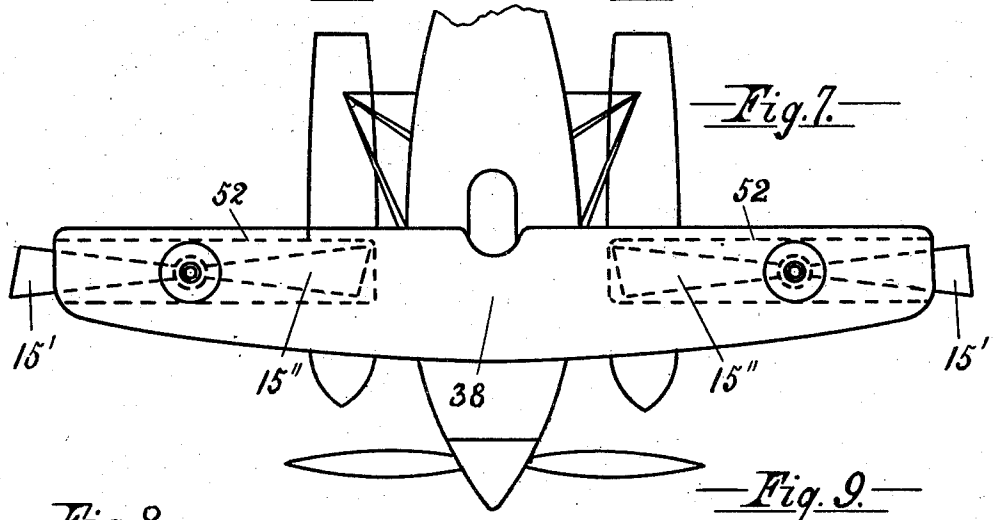


Fig. 7.

Fig. 8.

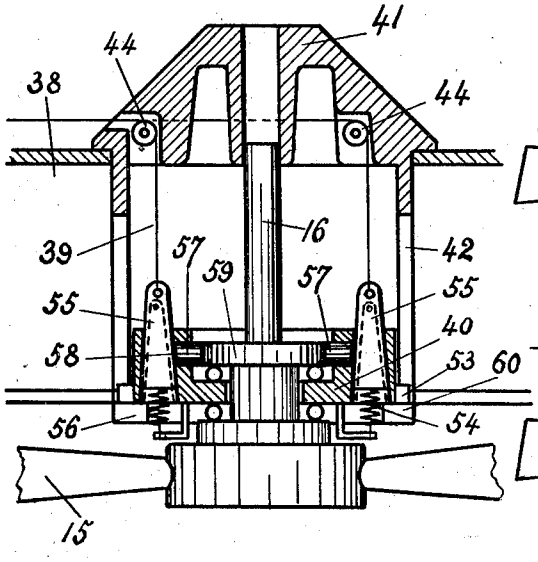


Fig. 9.

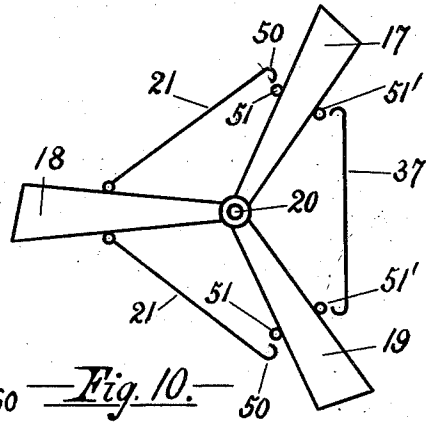
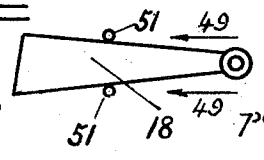


Fig. 10.



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FLYING MACHINE

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Application January 10, 1934, Serial No. 706,091
In Germany February 16, 1933

8 Claims. (Cl. 244—19)

This invention relates to flying machines, more particularly to airplanes adapted to operate at small speed when starting or landing and at high speed when in normal substantially horizontal flight.

An object of this invention resides in the provision of a new flying machine of such a design as to constitute little resistance to the air and to require little power for flying in any direction.

An object of this invention resides in the provision of a new flying machine which permits of very high speeds when moving in a substantially horizontal direction and which is also adapted to make steep ascents and descents.

An object of this invention resides in the provision of a flying machine having provisions adapted to considerably assist the upward and downward movement of the machine, said provisions constituting very little resistance to a horizontal movement of the machine.

An object of this invention resides in the provision of a new design for a flying machine having wing provisions particularly adapted for a substantially horizontal movement of the machine and having other provisions particularly suitable for promoting an upward or downward movement of the machine.

An object of this invention resides in the provision of a new design for a flying machine having wing provisions particularly adapted for a substantially horizontal movement of the machine and having other provisions particularly suitable for promoting an upward or downward movement of the machine, the latter provisions being adapted to be removed or held in a position where they constitute little resistance to the movement of the machine in a horizontal direction.

An object of this invention resides in the provision of a new design for a flying machine having wing provisions particularly adapted for a substantially horizontal movement of the machine and having other provisions particularly suitable for promoting an upward or downward movement of the machine, the latter provisions being also adapted to increase the lifting power when flying in a horizontal direction particularly when flying in such direction at reduced speed.

An object of this invention resides in the provision of a new design for a flying machine having wing provisions particularly adapted for a substantially horizontal movement of the machine and having other provisions particularly suitable for promoting an upward or downward movement of the machine, the latter provisions being also adapted to increase the lifting power when flying in a horizontal direction and being adjustable so that they can be changed while the machine is in operation either into a position in which they increase the lift power of the machine for horizontal flying or to a position in which they promote the upward or downward movement of the machine.

An object of this invention resides in the provision of a new and improved design for flying machines requiring only a small area for starting and landing and, at the same time, permitting of a very high load on the wings during normal operation.

An object of this invention resides in the provision of a new and improved design of a flying machine combining the advantages of an airplane with those of a helicopter and avoiding the disadvantages of each of these types of flying machines.

A further object of this invention resides in the provision of multi-bladed wing systems which can be folded up and are supplementary to the stationary wings of a flying machine.

Another object of this invention resides in the provision of a flying machine having multi-bladed wing systems which can be folded up and retracted into the fuselage and/or the stationary wings.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specification and claims and shown in the drawings which, by way of illustration, show what I now consider to be a preferred embodiment of my invention.

Retractable or auxiliary folding wings or flaps attached to the wings of an airplane produce little additional lift because they are of necessity small as compared with the main wings. When using rotating wings, the lift is materially increased but also the gliding resistance is substantially increased, and flying machines of this type are not suitable for high speed flying. I propose to make the stationary wings just large enough to suffice for forward flying and to provide one or more rotating wing systems revolved by the air current in order to facilitate a quick start and to reduce the landing speed; these systems are not in operation after the start, that is, when flying substantially horizontally they are wholly or partly withdrawn from the influence of the air current during the main flight until just before landing.

I can carry out my invention in several ways. For instance, I can arrange on top of the fuselage

a rotating system adapted to be folded up and withdrawn into the fuselage during normal flight. The folding up may be carried out similarly as is done with umbrellas. I can also provide below each stationary wing one or more freely rotatable two-bladed systems which are stopped after the start and so fixed that the longitudinal axes of their wings are in the direction of the flight. In this position the air resistance produced by the wing systems is smallest. If complete elimination of the resistance or air friction is desired, the two-bladed systems are held in a position where their longitudinal axes are perpendicular to the direction of the flight and the wings are withdrawn into the main wings of the plane. This affords the possibility of having a smaller or larger part of one wing of the rotating systems projecting beyond the free end of the main wing on which the system is mounted. In this case, the direction of rotation of the systems must be such that the projecting wings produce lift during the normal flight.

In the drawings:

Fig. 1 is a part side view and a part sectional view of a seaplane according to my invention with the rotating wing system in operating position.

Fig. 2 is a cross sectional side view of the fuselage with the rotating wing system in rest position.

Fig. 3 is a top view of a seaplane according to my invention.

Fig. 4 is a front view of a modified plane according to my invention.

Fig. 5 is a top view of the plane illustrated by Fig. 4 with the rotating wing systems in rest position.

Fig. 6 is a front view of a plane according to my invention having retractable rotatable wing systems.

Fig. 7 is a top view of the plane shown by Fig. 6.

Fig. 8 is a cross sectional view of a detail of the embodiment of my invention illustrated by Figures 6 and 7.

Fig. 9 schematically shows a collapsible rotatable wing system according to my invention in operating position.

Fig. 10 schematically shows a system as per Fig. 9 in folded position.

Referring more particularly to the drawings: Figures 1, 2, and 3 illustrate a seaplane constructed according to my invention. Like parts are designated by like numerals in these three figures. 1 is the fuselage, 2 the propeller, 3 and 4 the floats, and 5 the stationary wings. The size of the stationary wings is such that it is just sufficient for fast flying, but it would be too small for starting and landing.

On Fig. 3 the dotted line 6 indicates the size of the wing which would be necessary to enable the plane to make safe starts and landings. Instead of providing such large wings which would constitute a great resistance against normal horizontal flying, I provide for starting and landing purposes a system of rotating wings 7—7 which, under the influence of the air current, rotates around the hollow shaft 8. The simplest method of bringing the wings after the start to a position in which they offer least resistance to the air current consists in providing a brake system and in locking the wings in the position shown on Fig. 3, that is, so that the longitudinal axis of the wings is in the direction of the flight. Since the wings including the rigging and shaft still constitute a considerable resistance to the air current, it is advisable to fold the whole system into the fuselage. For this purpose the following arrangement may be made: the wings 7 are rotatably linked to the hub 9, which is rotatable with respect to the shaft 8, and are supported by stays 10; the latter are rotatably linked at one end to the sleeve 11 which is slidable on shaft 8 and adapted to be locked to said shaft at a certain point. This is accomplished by lever 31 which is rotatably connected to the sleeve 11; one arm of this lever is provided with a finger 32 which automatically inserts itself into an aperture 33 in the shaft 8 as soon as the sleeve 11 is at the proper point to assure a perpendicular position of the vanes 7 with respect to the shaft 8. This may be accomplished, for instance, by providing a spring member 47 which presses that arm of the lever provided with the finger 32 toward the shaft 8.

As soon as the machine has left the ground, the sleeve 11 is unlocked by manipulation of the lever 31 and moved toward the fuselage due to the weight of vanes 7; the vanes are thereby folded to the shaft 8 as shown in Fig. 2. A fulcrum 12 is provided on the fuselage 1 and the foot of the shaft 8 permitting the shaft together with the folded wings to be folded into the fuselage. The folded system may rest on a support 13. In order to erect the shaft 8 and bring the rotating wing system into operating position, as is desired when making a steep ascent or descent or when starting or approaching the ground, the shaft is provided at its lower end with a gear segment 22 cooperating with a worm 23 on shaft 24 which is supported by supports 34 and 35 and may be rotated by crank 25 located near the pilot's seat.

To unfold the wings 7 a rope 26 may be connected to the sleeve 11, said rope running over a roller 27 at the upper part of the hollow shaft 8 through the interior of the shaft and over a roller 28 located at the foot of shaft 8 and therefrom to a drum 29 which may be rotated by a crank 30 located near the pilot's seat. When winding up the rope 26 on the drum 29, the sleeve 11 is pulled upward along the shaft 8, and the stays 10 connecting the sleeve and the wings thereby move the wings into a position at right angles to the shaft 8.

Figures 4 and 5 illustrate a modification of my invention in which the rotating wing systems 14 are located underneath the main and stationary wings 5. When starting, ascending or descending at a steep grade the wings 14 are permitted to revolve under the influence of the air current. After the start and when flying at high speed in a substantially horizontal direction the wings 14 are locked in such a position as to constitute the least possible air resistance, that is, in a position parallel to the direction of flight. This locking may be accomplished by any known brake system or the like. This is diagrammatically shown by the brakes which may be operated from the pilot's seat by means of lever 61 and the ropes 62 and 63 connecting the lever and the brakes.

In order to further reduce the air resistance of the rotating wings, I can make provisions for retracting the wings into the stationary wings as illustrated by Fig. 6. The wing systems 15 are supported by the shafts 16 having a combination of axial and radial bearings at their lower ends. Shaft 16 can freely move upward and downward within the guide 41, the lower end of which is provided with a slot-like opening 42 to accommodate the wings 15 when in retracted position. The bearing at the lower end of the

shaft has a non-rotating part 40 which hangs on ropes 39. These ropes run over the rollers 44 and 45 to the drum 46 provided with crank 36 and located in the fuselage and accessible to the pilot. This is shown on Fig. 6. When winding up the ropes 39 on the drum 46, the shafts 16 together with the vanes 15 are pulled into the guide pieces 41. Since the opening in the lower part of the stationary wings will have a slot-like configuration as indicated by dotted lines 52 on Fig. 7, the wings 15 must be locked in a position in which their longitudinal axis is parallel to the longitudinal axis of the slot before the wings are retracted into the slot and the stationary wings. This locking may be accomplished by a brake system which may be arranged cooperatively with the mechanism for lifting the rotating wing systems.

An example of such a system is schematically shown in Fig. 8. In the ring member 40 which is prevented from rotating by flaps 53 sliding in the openings or guides 42, openings 54 are provided accommodating key-shaped members 55. The previously mentioned ropes 39 are connected to these key members. Springs 56 pull the keys 55 downward and into the openings 54. The keys 55 cooperate with the brake blocks 57 which are horizontally slidable in corresponding apertures 58 in the ring 40. When pulling the ropes 39 the keys 55 move upward and press the brake blocks 57 radially inward and on the collar 59 of shaft 16, thereby stopping the rotation of the shaft and the wings 15. When further pulling the ropes 39 ring 40 together with the whole rotating wing system is pulled upward as previously described.

For placing the rotatable wing systems 15 back into operating position and condition the ring 40 is let down by the ropes 39 as previously described. During the downward movement the whole mechanism hangs on the keys 55 pressing the brake blocks 57 on the collar 59 and thereby preventing a rotation of the wings 15. As soon as the system has reached operating position the flaps 53 come to rest on the bottom ring 60 of the support structure 41 and the keys 55 fall down due to their own weight and to the action of the springs 56 which are connected at one end to ring 40 and at the other end to brake blocks 57 thereby setting the brake blocks 57 free and permitting the wing system to rotate freely. This is indicated by dotted lines on Fig. 8.

I can make the rotating vanes of considerable size, whereas I reduce the size of the stationary wings as much as possible in order to reduce air resistance when flying horizontally. If the rotating wings are then too large to be entirely retracted into the stationary wings, I can arrange for part or all of one vane pertaining to the rotating wing system to project from the ends of the stationary wings also when the rotating vanes are lifted up into the stationary wings. This is illustrated by Fig. 7 where part of the vanes 15' projects from the stationary wings 47, whereas the vanes 15'' are entirely retracted into the wings 47. This method permits a further reduction of the size of the stationary wings additional lift being produced by the projecting part of the rotating wings. Of course, the direction of rotation of the rotating wing systems in such a case must be such that, when the system is locked in the position for horizontal flying, that is, retracted and with the longitudinal axis parallel to that of the stationary wings, the projecting part of the vanes 15' causes lift. In large planes the thickness of the wings 38 will be such that the guide 41 and the whole lifting mechanism will be within the wing body and will not constitute undesirable air resistance.

In all the above described embodiments of my invention rotating wing systems consisting of two vanes were employed. I can also use systems consisting of three or more individual vanes and design such systems to be collapsed or folded up when not needed. This may be carried out, for instance, as illustrated by Figures 9 and 10. The individual vanes 17, 18 and 19 are rotatably supported by a common shaft 20 but are loose with respect to one another and wings 17 and 19, for instance, may be folded underneath vane 18 thus forming a body of little air resistance when all three vanes are in the direction of the air current which is indicated by the arrows 49 on Fig. 10. In order to hold the individual wings apart and in operating position, stays 21 may be linked at one end to vane 18 and provided at the other end with hooks 50 which can be inserted into suitable eyes 51 provided on the wings 17 and 19. In addition a connecting link 37 may be provided and adapted to be hooked into eyes 51' on vanes 17 and 19 or linked to one of these vanes and adapted to be hooked to the other. A mechanism for unfolding a wing system as per Figures 9 and 10 and for holding it in operating position and adapted to be operated from the pilot's seat may be provided. This is not shown in the drawings as it is no subject of the present application.

While I believe the above described embodiments of my invention are preferred embodiments, I wish it to be understood that I do not desire to be limited to the exact details of design and construction shown and described, for obvious modifications will occur to a person skilled in the art.

What I claim is:

1. A flying machine having stationary wings and rotating wing systems, said stationary wings having openings corresponding to a part of said rotating wing systems, said rotating wing systems being adapted to be in part retracted into said openings and to, in part, laterally protrude from said stationary wings when retracted and to supplement by that part which laterally protrudes from said stationary wings, the lift produced by said stationary wings.

2. A flying machine having stationary wings and rotating wing systems, said stationary wings having openings corresponding to a part of said rotating wing systems, said rotating wing systems being adapted to be in part retracted into said opening and to, in part, protrude laterally beyond said stationary wings when retracted and to supplement by that part which protrudes from said stationary wings, the lift produced by said stationary wings, said rotating wing systems when in non-retracted position being located underneath said stationary wings.

3. A flying machine having stationary wings, a plurality of autorotative wings supported by said stationary wings and adapted to rotate in planes substantially parallel to said stationary wings, cavities in said stationary wings corresponding to a part of said autorotative wings, retracting means for retracting part of said autorotated wings into said cavities when flying at high speed, and brake means for holding said autorotative wings in position while being and when retracted into said cavities.

4. A flying machine having stationary wings, a plurality of autorotative wings supported by said stationary wings and adapted to rotate in

planes substantially parallel to said stationary wings, cavities in said stationary wings corresponding to said autorotative wings, retracting means for retracting said autorotative wings into said cavities when flying at high speed, and brake means for holding said autorotative wings in position while being and when retracted into said cavities, said retracting means and said brake means being operatively interconnected for assuring simultaneous operation of said retracting means and said brake means.

5. A flying machine having stationary wings, a plurality of autorotative wings supported by said stationary wings and adapted to rotate in planes substantially parallel to said stationary wings, cavities in said stationary wings corresponding to said autorotative wings, retracting means for retracting said autorotative wings into said cavities when flying at high speed, and brake means for holding said autorotative wings in position while being and when retracted into said cavities, said retracting means and said brake means having a plurality of members in common for assuring simultaneous operation of said retracting means and said brake means.

6. A flying machine having a fuselage, stationary wings, and a system of autorotative wings, said stationary wings being adapted to provide the lift required for flying at high speed in a substantially horizontal direction, said autorotative wings being adapted to provide additional lift when said machine moves at slow speed and consisting of a plurality of vanes, a hub, and a shaft supporting said hub and projecting from said fuselage when said autorotative wing system is in operation, said vanes being hinged to said hub and adapted to be folded up, said shaft being adapted to be laid over and into said fuselage, whereby said shaft, hub and vanes are completely hidden within said fuselage and constitute no air resistance.

7. A flying machine having a fuselage, stationary wings, and a system of autorotative wings, said stationary wings being adapted to provide the lift required for flying at high speed in a substantially horizontal direction, said autorotative wings being adapted to provide additional lift when said machine moves at slow speed and consisting of a plurality of vanes and a shaft rotatably supporting said vanes, said vanes being adapted to be rotated around said shaft into a position where they are adjacent to one another and constitute a very small surface exposed to the air current when said flying machine flies in a substantially horizontal direction.

8. A flying machine having stationary wings and a system of rotating wings, said stationary wings being adapted to provide the lift required for flying in a substantially horizontal direction and at high speed, said rotating wing system being adapted to provide additional lift when moving at slow speed, and consisting of a plurality of vanes, a hub and a shaft rotatably supporting said hub, said vanes being hinged to said hub and adapted to be folded up in the plane of rotation of said vanes into a position where said vanes are adjacent to one another and constitute a very small surface exposed to the air current when said machine flies in a substantially horizontal direction.

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