Dec. 30, 1941. J. M. H. JACOBS 2,268,487

TOY AIRPLANE

Filed March 17, 1939 2 Sheets-Sheet 1

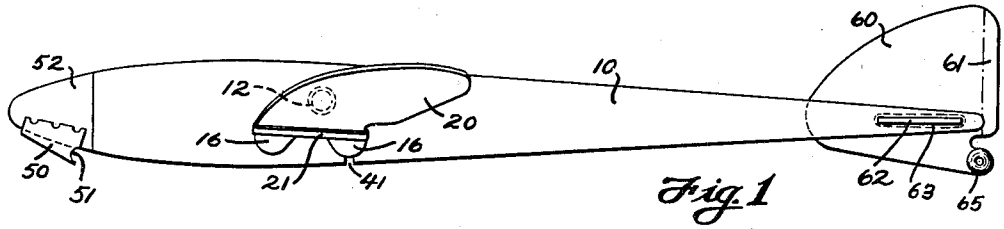


Fig. 1

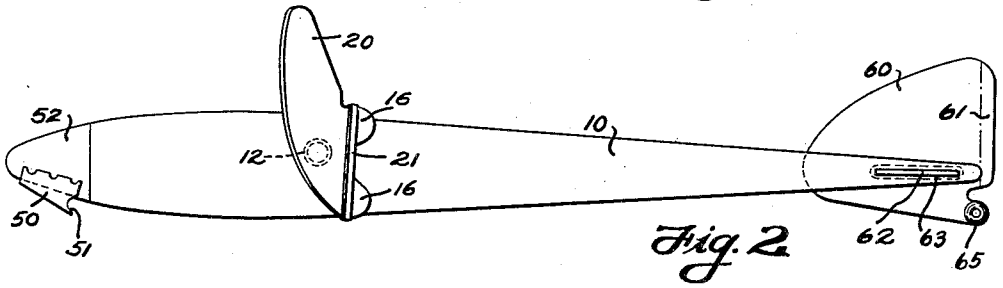


Fig. 2

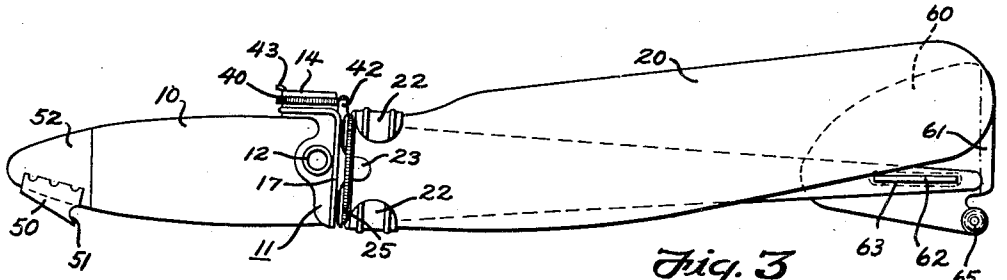


Fig. 3

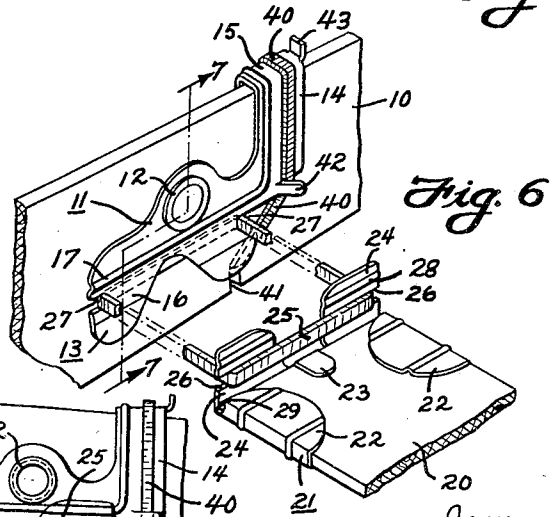
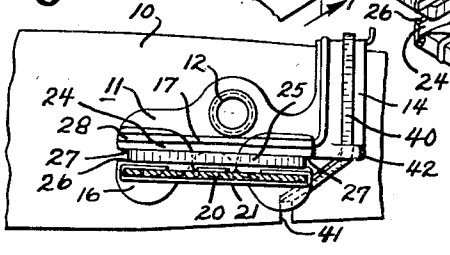


Fig. 6

Fig. 5



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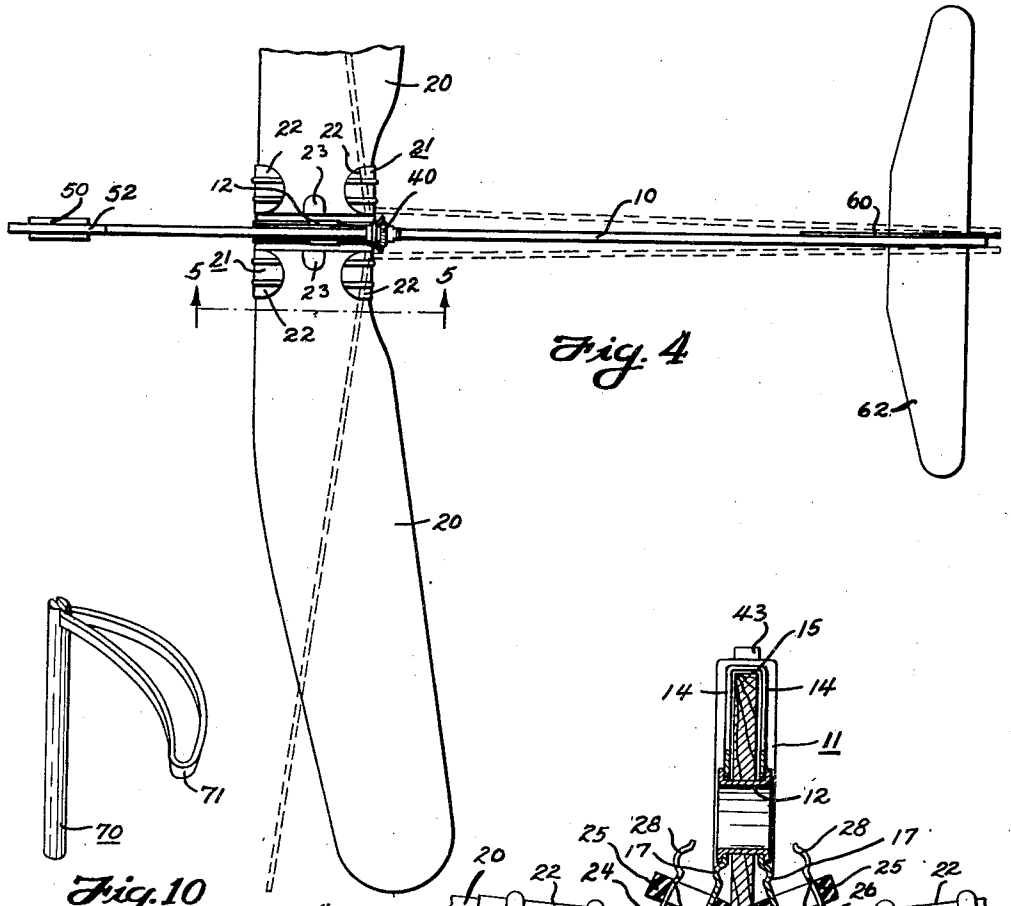

Fig. 4

Fig. 10

Fig. 7

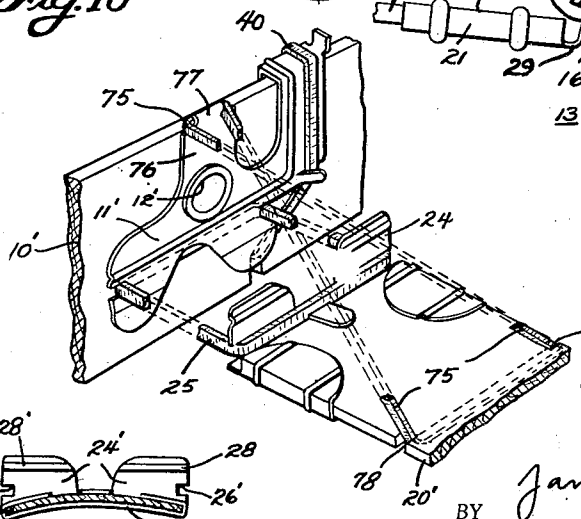

Fig. 8

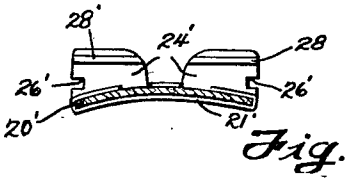

Fig. 9

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TOY AIRPLANE

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Application March 17, 1939, Serial No. 262,475

15 Claims. (Cl. 46—80)

This invention relates to improvements in toy airplanes of the glider type, and especially to the type which is adapted to be projected into the air at relatively high speed such as by means of a catapult when said airplane is in folded form, and will automatically unfold into its flying form at or near the top of its flight and thereupon enter into a glide.

An object of the invention is to provide a toy glider which has the appearance of a real airplane while gliding, but which has very small air resistance when in its folded form and therefore may be more readily projected to greater heights and without damage thereto.

Another object is to provide for the folding of the wings to a substantially vertical position closely alongside the fuselage with the following resultant advantages:

1. The air resistance of the folded glider is greatly reduced when forcibly projected at an angle against the wind.

2. The compactness of the folded glider is such that it may be projected through the air at high speed at a minimum danger of damage thereto due to air pressure upon its wings or other parts.

3. The wing tips being substantially vertical and close together when in folded position, may be readily grasped between the thumb and forefinger of one hand of the operator and pressed tightly together against the vertical fin or rudder without damage to any parts, whereby the entire glider may be readily pulled back with great force against the resistance of the catapult spring and readily released, in a very efficient and simple manner.

4. The wings and fuselage even when fully assembled together may be folded together with a maximum of compactness for packing in a box or for general handling, and when in this folded form the wings and fuselage reinforce each other to minimize possibility of damage thereto.

Another object is to provide a single hinged wing mount for mounting both wings upon the fuselage, whereby both wings are maintained at their predetermined angle of attack when in flying position due to their interfitting relation with said single wing mount. In other words both wings have a positively predetermined angle of attack when said wing mount is in its flying position and hence the glider will not be thrown out of lateral balance at any time due to one wing varying its angle of attack relative to the other wing.

Another object is to provide a simple and efficient horizontal transverse hinge connection between said single wing mount and the fuselage, whereby both wings may be manually rotated as a unit together with the wing mount until the plane of both wings is substantially vertical, after which both of said wings may be manually swung about their inner connections on said mount to their folded position alongside the fuselage.

A more specific object is to provide a unitary one piece pressed metal wing mount which is folded around the vertical edge of the fuselage and thus provides a mounting bracket on the opposed sides of said fuselage for mounting the two separate wings to said fuselage. Another important feature is the use of the upper metal fold around the vertical edge of the fuselage as a positive efficient stop to properly locate the wing mount in its flying position, thus greatly simplifying the structure and reducing the number of parts.

Another object is to provide a horizontal tail fin so located and arranged that when the wings are in this vertical folded position alongside the fuselage, the vertical edges of said wings will ride upon said tail fin during the forced projection of the glider and so prevent said wings from swinging edgewise in a vertical plane until the projected speed of the glider is reduced sufficiently for the wings to swing flat-wise outwardly against the air pressure at a very material angle. Thus the horizontal tail fin delays the return movement of the wings to their flying position until the projected air speed of the glider is quite small, whereby the glider may be projected to greater heights than otherwise could be done.

A still further object is to provide separately tensioned spring means for automatically rotating the hinged wing mount about its transverse pivot axis on the fuselage and for swinging the two wings laterally outward from their folded position alongside said fuselage.

Further objects will appear hereinafter from the following detailed description and accompanying drawings.

Fig. 1 is a side elevation of the glider in flight.

Fig. 2 shows the initial folding step, the wings and wing mount being rotated as a unit about a transverse pivot on the fuselage until the plane of the wings is substantially vertical.

Fig. 3 shows the wings completely folded alongside the fuselage.

Fig. 4 is a plan view of the glider in flight, but shows in dotted lines the initial and final folded positions of the wings.

Fig. 5 is an enlarged section on line 5—5 of Fig. 4.

Fig. 6 is an enlarged perspective view of the connection between the wings and fuselage, but shows the wing pulled outwardly away from the wing mount by stretching the retaining elastic rubber band.

Fig. 7 is a section on line 7—7 of Fig. 6 on a larger scale, and shows both wings pulled slightly away from the wing mount to better show the construction of the parts.

Fig. 8 is similar to Fig. 6 but shows a modified form of the invention.

Fig. 9 is a detail view of a slightly modified form of wing fitting for cambered wings.

Fig. 10 is a view of a catapult for projecting the glider into the air.

Similar reference characters refer to similar parts thruout the several figures of the drawings.

Referring to the drawings, 10 designates the fuselage or elongated body of the glider which preferably is of narrow width and relatively great vertical depth, as shown in Figs. 2 and 4. The unitary wing mount is preferably stamped from flat metal of suitable guage to the form illustrated and pivotally mounted upon the fuselage 10 by the transversely extending pin 12, which is here shown as a double flanged metal eyelet of substantial diameter to provide strength and a large bearing surface on the fuselage 10. This pivoted wing mount 11 has integral therewith two wing mounting brackets 13 on opposite sides of the fuselage rigidly connected by the offset U-shaped portion 14 which extends around the upper edge of fuselage 10 and so forms an efficient stop 15 for positively locating said wing mount 11 in its correct flying position relative to the fuselage as shown in Fig 6.

Each wing bracket 13 comprises an outwardly bent flat portion 16 and a raised ridge 17 very accurately formed thereon to properly locate the flying angle of attack of the wings 20. Each wing 20 has a metal fitting 21 rigidly fixed to its inner end, preferably by means of clamping ears 22 and 23 (see Fig. 6). Each wing fitting 21 has an upturned flange 24 thereon which bears flat against the portion 16 of the mounting bracket 13 and is yieldably forced thereagainst by the small elastic rubber band 25. Rubber band 25 is retained in place by the small registering notches 26 and 27 in the wing flange 24 and the bracket portion respectively. But this rubber band 25 and its retaining notches 26 and 27 will not sufficiently positively locate the wing in its correct flying angle of attack relative to the wing mount 11, since it is very essential from an aerodynamic standpoint that this angle of attack of both wings be very accurately located and maintained for proper flight of the glider. Hence each wing flange 24 has accurately formed therein a groove 28 within which the raised ridge 17 accurately fits or internests when these parts are forced together by the rubber band 25 in order to positively predetermine and maintain the angle of attack of the wing when the rotable wing mount 11 is in its flying position with its stop 15 against the top edge of the fuselage 10 (see Figs. 5 and 6). In actual operation the rubber band 25 will always return the foldable wing 20 to its approximately correct flying angle of attack, whereupon the groove 28 will snap in place over the ridge 17 and thus very accurately and positively locate the wing at its predetermined flying position. Thus it will now be clear that the wings 20 may be manually folded backward from their position shown in Fig. 2 simply by stretching the rubber bands 25 while the wing flanges 24 pivot at their lower edges 29 upon the bracket portion 16, however upon release of the wings the rubber bands 25 will return them back to their approximately correct position and the ridges 17 and grooves 28 will accurately locate the wings upon the wing mount 11.

Now it is obvious that the wing mount 11 must also be accurately located in its predetermined flying position. This is done by the rubber band 40 which fits into a lower notch 41 in the bottom edge of the fuselage and extends upwardly around the fuselage and over the top of the U-shaped portion 14 of the wing mount 11. In order to properly clear the rotating motion of wing mount 11 and at the same time reduce the initial returning urge thereof, this rubber 40 is guided backwardly by two small ears 42 bent up from the metal of wing mount 11 and retained in place on top of stop 15 by a similar small metal ear 43. Now when wing mount 11 together with the two wings 20 are rotated as a unit to the position shown in Fig. 2 where the forward edge of portion 14 abuts the top of the fuselage, the rubber band 40 is materially tensioned and hence will, when given the chance, return wing mount 11 until the stop 15 rests against the top of the fuselage (as shown in Figs. 5 and 6). The bearing area of stop 15 is made large enough so as to prevent its hammering a depression in the top edge of the fuselage even tho the fuselage be frail and of light material.

The fuselage 10 and wings 20 are preferably made of thin flat strips of balsa wood, tho they may be of card board or other suitable light material. A metal stamping 50 of substantial weight is fixed to the forward end of fuselage 10 by any suitable means, preferably by being clamped tightly thereupon over a substantial area so as to not damage the frail material thereof. Preferably the nose portion 52 of fuselage 10 is impregnated with some suitable reinforcing material, such as nitro-cellulose or any suitable resin dissolved in a volatile solvent, so as to strengthen and harden same and to more firmly retain the metal part 50 thereupon. A hook 51 is provided on the bottom of the stamping 50 by means of which the rubber band catapult shown in Fig 10, or other spring projecting means, may be readily used with the glider.

The vertical tail fin 60 is preferably made of tough card board and glued against one side of the rear end of fuselage 10 (see Fig. 4). Preferably tail fin 60 extends substantially below the lower edge of fuselage 10 and has a portion 65 which simulates the appearance of a tail wheel and actually materially protects the rear end of the fuselage against being broken or damaged. Preferably tail fin 60 projects rearwardly slightly beyond fuselage 10 and has an integral narrow rudder portion 61 which may be bent laterally to the right or left as desired by the operator in order to obtain a set rudder position to cause the glider to spiral either to the right or left as desired, or fly straight ahead. A very narrow width rudder portion 61 will better retain its bent setting and still give effective rudder control of the glider.

The horizontal tail fin 62 is preferably a separate piece of balsa wood or other suitable light material removably but snugly inserted thru a

horizontal slot 63 cut thru both the fuselage tail and the vertical fin 60. Thus the vertical fin 60 being glued over the full width of the end of the fuselage 10 will greatly strengthen and reinforce the narrow sections of the fuselage extending about the slot 63, and thus permit the repeated insertion and removal of the horizontal fin 62 without danger of breaking out the slot 63.

It will be noted from Fig. 3 that when wings 20 are folded back alongside fuselage 10 the bottom edges of the wings rest upon the upper surface of horizontal fin 62. Since in this position of the wings the rubber band 40 is urging the wing mount 11, and hence also the wings 20, to rotate in a clockwise direction (as seen in Fig. 3), it will be clear that tail fin 62 will serve as a stop against such clockwise rotation of wing mount 11 so long as wings 20 are folded backward at a sufficient angle to overlie the tail fin 62. In other words, the wings 20 are positively held against downward or edgewise forward swinging by tail fin 62 until the projected forward speed of the glider is sufficiently reduced to first allow the lateral or flatwise swinging of the wings beyond the tips of the horizontal fin 62. Obviously the wind pressure due to projected speed will act much stronger and longer to hold the wings 20 against flatwise swinging than it would to hold the wings against edgewise swinging. This simply means that the tail fin 62 delays the return swinging movement of the wings 20 to their flying position until the projected air speed of the glider is quite small and so permits the glider to be much more readily projected to greater heights.

In operation, to fold the wings the wing mount 11 together with wings 20 are first rotated about a pivot 12 against the urge of rubber band 40 to the position shown in Fig. 2, after which the two wings are swung rearwardly against the urge of rubber band 25 to lie in a substantially vertical plane in direct contact with the vertical tail fin 60 to the position shown in Fig. 3. The operator then easily grasps and compresses both wings 20 and tail fin 60 between his thumb and forefinger of one hand and pulls the entire glider backward against the strong urge of the rubber band 71 of the projecting catapult 70 which is hooked into the forward hook 51, which catapult the operator ordinarily holds in his other hand. Upon release of the wing tips by the operator, the glider is projected with folded wings at high speed into the air by the the catapult rubber 71 acting on hook 51. The wind resistance during the projected flight will be very small due to the wings, fuselage, and vertical tail fin 60 being folded compactly together and in effect constituting a single flat body with but little air resistance. After the projected speed is gradually reduced sufficiently for the wings to move flatwise against the wind until they swing beyond the tips of horizontal tail fin 62, the rubber band 40 immediately rotates wing mount 11 together with wings 20 in a clockwise direction (as seen in Fig. 3) until stop 15 abuts the upper edge of the fuselage 10. This rotating action by rubber band 40 is quite rapid since it causes the wings to move edgewise against the wind. By the time stop 15 reaches its final position or slightly thereafter, depending upon relative tensioning of the rubber bands 40 and 25, the rubber bands 25 will rotate wings 20 until the grooves 28 are snapped over the ridges 17 to properly and accurately locate the wings in their correct flying position. The glider then simply enters upon its glide due to its weighted nose and may glide straight or spiral either to the right or left depending upon the previous setting of the rudder 61.

The form of the invention shown in Fig. 8 differs from that described above only by the addition of another rubber band 75 for each wing 20' and the small changes necessary for such addition. The pivoted wing mount 11' has an integral projection 76 on each side thereof and each projection has a hook portion 77 at the tip thereof to receive the rubber band 75, as clearly shown in Fig. 8. Each wing 20' has opposed notches 78 therein to retain rubber 75 in its desired place on the wing. Rubber band 75 is simply passed around the lower surface of the wing, thru the notches 78, then crossed over and hooked over the hook portion 77 on wing mount 11', as clearly shown. Bands 75 are tensioned only sufficiently to prevent any drooping of the wings from their normal position. When the wings are folded back as shown in Fig. 3 the bands 75 are stretched and hence the bands 75 aid the rubber bands 25 in returning the wings to flying position as previously described. It will be noted that these additional bands 75 in no way interfere with the pivoting of the wing mount 11' about its pivot 12' or fuselage 10'. Bands 75 serve as landing wires, in other words help support the weight of the wings in such designs wherein this cannot be readily done by rubber bands 25.

Fig. 9 shows a metal wing fitting 21' which differs from wing fitting 21 described above only by being made to conform to a cambered wing 20' rather than to a plane surface wing. The curved portion of this wing fitting 21' will positively curve or "camber" the attached end of any slightly flexible flat wing and thus provide a camber therein in a very simple and economical manner. It will be noted that the hinge grooves 28' which fit over the ridges 17 on the hinge mount, remain perfectly straight.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In a toy airplane, a fuselage, a pair of folding wings, means for mounting a wing on each side of said fuselage in such manner as to permit them to pivot about an axis transverse to said fuselage from their normal flying position to a substantially vertical position and to thereafter permit them to be swung to a substantially vertical folded position alongside said fuselage in lapping contact with each side thereof.

2. In a toy airplane, a fuselage, a pair of folding wings, means for mounting a wing on each side of said fuselage in such manner as to permit them to pivot about an axis transverse to said fuselage from their normal flying position to a substantially vertical position and to thereafter permit them to be swung to a substantially vertical folded position alongside said fuselage in lapping contact with each side thereof, and spring means for urging said wings from their folded position to their normal flying position.

3. In a toy airplane, a fuselage, a pair of folding wings, means for mounting said wings upon said fuselage in such manner as to permit them to pivot about an axis transverse to said fuselage

from their normal flying position to a substantially vertical position and to thereafter permit them to be swung to a substantially vertical folded position alongside said fuselage, and two independently tensioned spring means for urging said wings to return to their correct flying position from their folded position, one of said spring means causing the return pivotal movement about said transverse axis and the other of said spring means causing the return swinging movement away from alongside said fuselage.

4. In a toy airplane, a fuselage, a pair of folding wings, a wing mount pivotally mounted upon said fuselage about a transverse axis thereto so as to be rotatable from a normal flying position to a wing-folded position, each of said wings being normally retained upon said wing mount in normal flying position but being manually foldable relative thereto to a position alongside said fuselage when said wing mount is rotated to its wing-folded position.

5. In a toy airplane, a fuselage, a pair of folding wings, a wing mount pivotally mounted upon said fuselage about a transverse axis thereto so as to be rotatable from a normal flying position to a wing-folded position, each of said wings being retained and located in correct flying position by said wing mount when said mount is in its flying position, said wings and wing mount being rotatable together until the plane of said wings is substantially vertical, after which said wings are manually foldable to a substantially vertical folded position alongside said fuselage.

6. In a toy airplane, a fuselage, a pair of folding wings, a wing mount pivotally mounted upon said fuselage about a transverse axis thereto so as to be rotatable from a normal flying position to a wing-folded position, each of said wings being retained and located in correct flying position by said wing mount when said mount is in its flying position, said wings and wing mount being rotatable together until the plane of said wings is substantially vertical after which said wings are manually foldable to a substantially vertically folded position alongside said fuselage, and resilient means for urging said wings from their folded position to their flying position.

7. In a toy airplane, a fuselage, a pair of folding wings adapted to be folded alongside said fuselage, a unitary wing mount pivoted to said fuselage on a horizontal pivot axis transverse to said fuselage, means for normally holding said mount in its flying position, means on said mount for supporting each of said wings in their correct flying position when said mount is in its flying position, said mount and wings being manually pivotable as a unit about said pivot axis until the planes of said wings are approximately vertical, and said wings being thereafter swingable upon said mount to a vertical position closely adjacent to said fuselage and where the two wing tips may be readily grasped between the thumb and fore-finger of the operator.

8. In a toy airplane, a fuselage, a pair of folding wings adapted to be folded alongside said fuselage, a unitary wing mount pivoted to said fuselage on a horizontal pivot axis transverse to said fuselage, means for normally holding said mount in its flying position, each of said wings having on its inner end a bracket interfitting with said mount in such manner as to locate said wings at their exact flying angle, said mount and wings being manually pivotable as a unit about said transverse axis and said wings being thereafter swingable upon said mount to a folded vertical position alongside said fuselage where the two wing tips may be grasped between the thumb and fore-finger of the operator.

9. In a toy airplane, a fuselage, a pair of folding wings adapted to be folded alongside said fuselage, a unitary wing mount pivoted to said fuselage on a horizontal pivot axis transverse to said fuselage, means for normally holding said mount in its flying position, each of said wings having on its inner end a bracket interfitting with said mount in such manner as to locate said wings at their exact flying angle, said mount and wings being manually pivotable as a unit about said transverse axis, and said wings being thereafter swingable upon said mount to a folded vertical position alongside said fuselage where the two wing tips may be grasped between the thumb and fore-finger of the operator, and resilient means for urging said wings to return to their flying position upon being released.

10. In a toy airplane, a fuselage having a horizontal tail fin, a pair of folding wings, a wing mount pivoted upon said fuselage on a horizontal pivot axis transverse to said fuselage, means for yieldably holding said wing mount in its flying position, each of said wings interfitting with said mount so as to locate said wings at their exact flying angle, said mount and wings being manually pivotable as a unit about said transverse axis and said wings being thereafter swingable upon said mount to a folded position alongside said fuselage where the wing edges ride upon said tail fin, and resilient means for urging said wings to return to their flying position when released, said tail fin aiding in delaying said return movement of said wings to flying position.

11. In a toy airplane, a fuselage having a horizontal tail fin, a pair of folding wings, a wing mount pivoted upon said fuselage on a horizontal pivot axis transverse to said fuselage, means for yieldably holding said wing mount in its flying position, each of said wings interfitting with said mount so as to locate said wings at their exact flying angle, said mount and wings being manually pivotable as a unit about said transverse axis and said wings being thereafter swingable upon said mount to a folded position alongside said fuselage where the wing edges ride against said tail fin, in such manner that said tail fin aids in retaining said wings in their folded position.

12. In a toy airplane, a fuselage portion having a horizontal tail fin thereon, a pair of folding wings, a wing mount pivoted upon said fuselage on a horizontal axis transverse to said fuselage, each of said wings being detachably associated with said mount whereby the wings are located at their exact flying angle, yielding means for holding said wing mount in a normal flying position, said mount and wings being manually pivotable as a unit about said transverse axis and against said yielding means and said wings being thereafter swingable to a folded position alongside said fuselage whereby the wing edges ride against the tail fin and may be grasped between the thumb and forefinger of an operator, said wings returning to their flying position upon release by the action of said yielding means.

13. In a toy airplane, a fuselage, a pair of wings, a wing mount horizontally pivoted upon said fuselage about a horizontal axis transverse thereto so as to be rotatable from a normal flying position to a wing folded position, resilient attachment means for associating the wings with the wing mount and for urging the wings to a

position at right angles to said fuselage, resilient means for urging said wing mount in its flying position, said wing mount being rotatable against said second resilient means until the plane of said wings is substantially vertical after which said wings may be manually folded to a position in a plane parallel to said fuselage against the action of said resilient attachment means whereby said wings and wing mount upon release resume a flying position.

14. In a toy airplane which is adapted to be thrown into the air by a spring projecting means or the like, the combination comprising a fuselage, a pair of folding wings, a wing mount pivotally mounted upon said fuselage about a transverse axis thereto so as to be rotatable from a normal flying position to a wing-folded position, each of said wings being normally retained upon said wing mount in normal flying position but being manually foldable relative thereto to a position alongside said fuselage when said wing mount is rotated to its wing-folded position, and a hook at the front end of said fuselage adapted to engage the spring projecting means.

15. In a toy airplane, a fuselage, a pair of folding wings, a wing mount pivotally mounted upon said fuselage about a horizontal axis transverse thereto and rotatable from a normal flying position to a wing folded position, resilient means for attaching the wings to said wing mount and for urging said wings to normal flying position relative thereto, said wings being manually foldable relative thereto and against said resilient means to a position alongside said fuselage when said wing mount is rotated to its wing folded position, and a second resilient means for urging said wing mount to said normal flying position.

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