April 16, 1946. J. R. CAMPBELL 2,398,357

ANTENNA MAST

Filed Jan. 19, 1944

FIG. 1

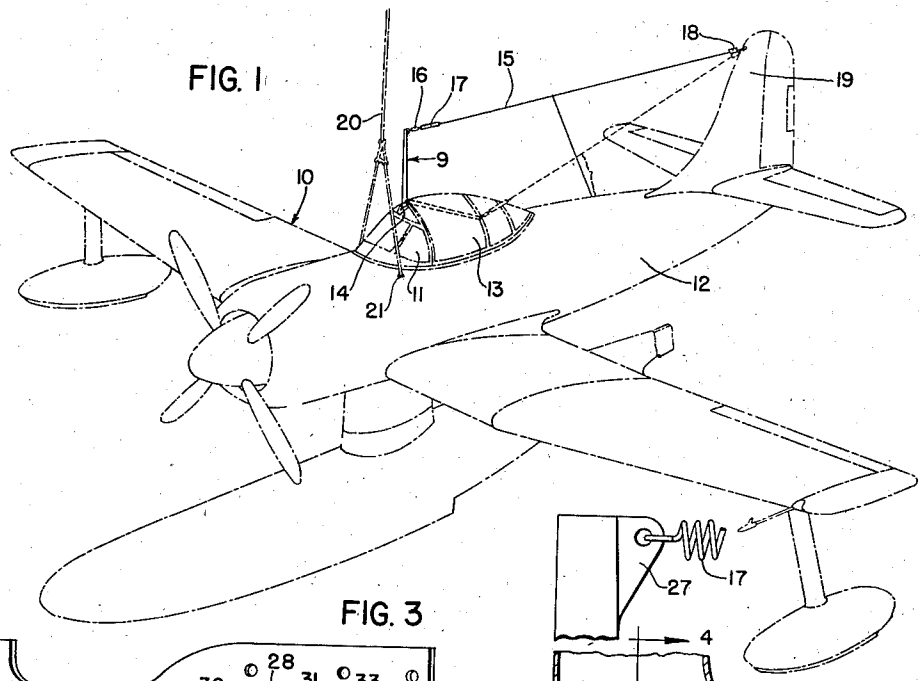
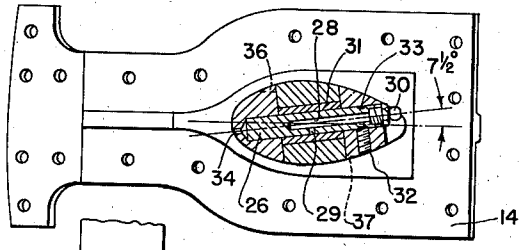


FIG. 3



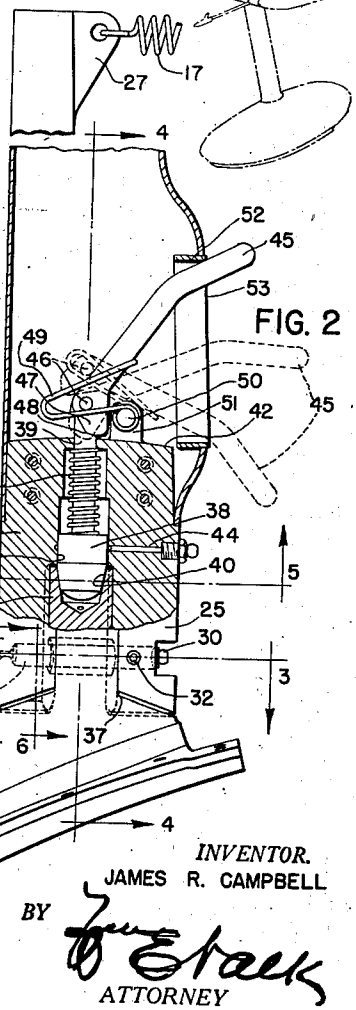


FIG. 2

FIG. 4

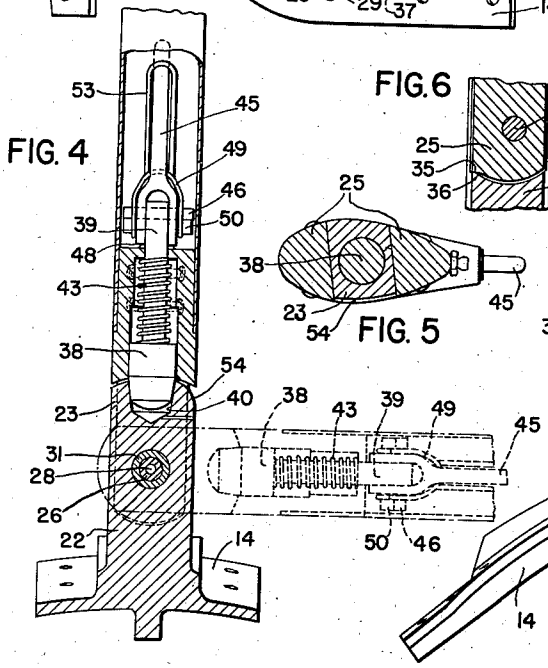


FIG. 6

FIG. 5

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ANTENNA MAST

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7 Claims. (Cl. 287—99)

This invention relates to antenna masts which are adapted especially, although not necessarily, for use in connection with aircraft, being concerned more particularly with a collapsible antenna mast which may be releasably secured in its elevated position and which may be lowered when the aircraft by which it is carried is to be handled by a hoisting sling, or similar apparatus, in order to thereby avoid, in so far as possible, damage to the mast, the antenna, or that portion of the aircraft by which the mast is supported.

One object of the invention is to provide an antenna mast of the character generally described which may be securely locked against vibration in its elevated position and wherein provision is made for facilitating the release of the mast when it is to be lowered or collapsed.

A further object is to provide a mast wherein the mechanism which is employed to releasably secure the mast in its elevated position, is housed in such a manner that it is well protected from the elements and may be readily actuated from the exterior of the aircraft by which it is carried.

A still further object is a novel design and arrangement of the parts of the mast, whereby to provide compensation for wear and obtain simplicity in construction and dependability in operation.

The invention is illustrated in the accompanying drawing, in which:

Figure 1 is a perspective view of an airplane carrying an antenna mast embodying the features of the invention, a hoisting sling being shown attached to the airplane in a conventional manner.

Figure 2 is an enlarged side view, partially in elevation and partially in section, of the antenna mast.

Figure 3 is a horizontal section through the mast taken along line 3—3 of Figure 2.

Figure 4 is a vertical section taken along line 4—4 of Figure 2.

Figure 5 is a horizontal section taken along line 5—5 of the same figure.

Figure 6 is a fragmentary, vertical section taken along line 6—6 of Figure 2.

The antenna mast, indicated at 9, is illustrated by way of example in connection with an airplane 10 of the type designed to arise from and alight on water. The cockpit of the airplane shown is enclosed by a windshield 11, which is fixed to the fuselage 12, and a sliding hatch 13, the latter fitting against the windshield when closed and, in accordance with conventional practice, being movable rearwardly to provide access to the cockpit. A base member 14 of the mast is mounted at the top of the windshield, preferably so that the mast is supported in the plane of symmetry of the airplane. An antenna 15 is connected at one end by an insulator 16 and spring 17 to the upper end of the mast and is connected at its opposite end by an insulator 18 to the leading edge of a vertical fin 19. A hoisting sling for lifting the airplane from the surface of the water on which it may rest is sufficiently indicated for the purpose in view by a showing of the lower end 20 thereof, it being the practice to attach the sling to the fuselage close to the center of gravity of the airplane so that the latter will, as illustrated, normally assume a substantially horizontal position. However, being exposed to air currents, the airplane may, while being hoisted, be caused to pivot forwardly or rearwardly about the points 21 at which the sling is attached to the fuselage. In the event that the airplane should pivot forwardly there is a real possibility that the mast will engage or become entangled with the sling, with resultant damage to the mast, the windshield to which the fast is attached or the antenna. In order to avoid this possibility the mast is designed so that it may be lowered to the dotted-line position indicated in Figure 1. When the mast is lowered to such position, the airplane may swing about the attachment points 21 through a wide range of movement without danger of interference between the mast and the hoisting sling when the airplane is being handled as an incident to its storage aboard a water-born craft or for other purposes.

As illustrated, the base member 14 seats against a transparent panel of the windshield and is formed with attaching flanges to facilitate its mounting upon said panel and the framework of the windshield. An elevated portion 22 on the base member 14 is formed with a transversely extending tongue 23 to which the lower end of the mast is pivotally connected by a coupling member 24. The upper end of the latter is suitably secured in the lower end of the hollow body of the mast while legs 25 at the lower end of the coupling member straddle the tongue 23 and are pivotally connected thereto by a pin 26, the end of the tongue 23 and the ends of the legs 25 being arcuate and being accommodated in conforming recesses formed in the coupling and base members. Preferably the mast with respect to its cross section, and including the elevated portion 22 of the base member, is of streamline form, the upper end of the mast carrying an ear 27 for supporting the leading end of the antenna. The

pin 26 may, as illustrated in Figure 3, be formed with a bore 28 and a port 29 through which lubricant introduced into the pin through a fitting 30 may escape to lubricate the exterior surface of the pin and the interior surface of a bushing 31 in which the central portion of the pin is accommodated, as well as lubricating the contacting surfaces of the tongue 23 and legs 25. Preferably the bushing 31 is pressed into the tongue 23 so that it will be held against rotation, the pin 26 being secured against axial displacement by a set-screw 32 which is carried by the rear leg of the coupling member and the inner end of which is accommodated in a circumferential groove 33 formed in the outer end of the pin. As the set-screw engages the pin in the groove 33, it will not mar or otherwise damage the bearing surface of the pin in such a manner that the latter will score the bearing surface of the rear leg when it is removed. In order to facilitate removal of the pin when it is desired to dismount the mast, an access aperture 34 is formed in the front leg of the coupling member 24. Hence when the set screw 32 is sufficiently loosened and the fitting 30 is removed, a tool may be inserted through the said aperture to engage the pin and expel it.

The base member is adapted to support the mast either in an elevated or in a collapsed, or lowered, position, the mast in the latter position being substantially horizontal and occupying a plane which is substantially normal with respect to the plane which it occupies when elevated. In order to avoid an increase in the tension of the antenna 15 which would otherwise occur when the mast is lowered and at the same time preferably reduce such tension, the pin 26 is so mounted that as the mast is lowered the outer end thereof is swung slightly in the direction of the tail fin 19. By mounting the pin 26 at an angle of 7½ degrees with respect to the transverse major axis of the mast, as indicated in Figure 3, the distance between the attachment ear 27 and the point of attachment of the antenna with the tail fin 19 will be reduced as the mast is lowered. The tension upon the antenna will, therefore, be correspondingly lessened, it being understood in this connection that the plane which the pin 26 occupies is substantially normal with respect to the longitudinal axis of the mast when the latter is elevated.

In order to limit the angular movement of the mast upon the pin 26, the forward leg 25 of the coupling member is formed with a shoulder 35 (Figure 6) which engages a stop portion 36 on the base member as the mast, moving from a lowered position, reaches its normal elevated position. When the mast is moved from an elevated to a lowered position, the opposite side of the rear leg 25 of the coupling member engages a stop portion 37 on the base member to arrest the mast when the latter reaches a substantially horizontal position.

The mast is locked in its elevated position by a plunger-like detent 38 which is carried by a stem 39, the detent being formed with a tapered end which is adapted to be accommodated in a socket 40 formed in the tongue 23. The detent has a relatively close sliding fit in the lower end of a bore 41 in the coupling member and the tapered end extends between the legs 25 of the coupling member. The bore 41 which terminates short of an arched top wall 42 of the coupling member accommodates the stem 39 and a spring 43 which acts against the detent to bias it toward an extended, or locking, position. The detent may be adequately lubricated by a suitable medium which may be introduced into a duct 44.

A forked inner end of a lever 45 is pivotally connected by a pin 46 to the upper end of the stem 39, the legs 47 of the forked end of the lever being formed to provide cams 48 which are engageable with the arched top wall 42 of the coupling member to initiate withdrawal of the detent 38. A spring 49 which is formed with companion loops, one of which is located at either side of the stem 39, is connected at its ends to the opposite ends of a cross-pin 50 which is carried by a shoulder 51 on the top wall of the coupling member 24, the spring 49, at the juncture of its two loops, engaging the lever 45 normally to hold it in an upper, or retracted, position, as indicated in full lines in Figure 2. When held in this position the cams 48 on the lower end of the lever 45 are supported above and out of contact with the top wall of the coupling member. The cooperating tapered walls of the detent and socket and the spacing of the cams 48 above the top wall of the coupling member insure locking of the mast in its elevated position so that it will be held against vibration. At the same time provision is made for compensating for wearing of the parts. Except for the outer end of the actuating lever 45, the parts of the locking mechanism described are wholly enclosed within the mast, the hollow body of the latter being formed with an elongated opening 52 in which a collar 53 is suitably secured and being extended rearwardly in this area. The side walls of the collar provide a guideway for the free end of the lever while the two end walls define the two limits of its range of movement.

When it is desired to release the detent 38 so that the mast may be lowered, it is only necessary to actuate the lever 45. As the latter is swung downwardly the cams 48 act upon the top wall of the coupling member to thereby initiate withdrawal of the detent from its socket in the said wall. By virtue of the use of the airplane under conditions which, at times, promote the accumulation of moisture on the parts of the locking mechanism, there may be a tendency, which is aggravated by the shape of the interfitting parts, for the said parts to seize. However, owing to the high mechanical advantage obtained by the cams 48, freeing of the detent in its socket may be readily effected despite such tendency. Thereafter, of course, a high mechanical advantage is not required. Hence, after the detent is freed and as the lever is moved further in the same direction, the lever engages and pivots about the shoulder 51, utilizing the latter as a fulcrum during its movement from the intermediate, dotted-line position shown in Figure 2 to the lowermost, dotted-line position. In other words during the initial part of its movement the cams give the lever a high enough mechanical advantage to insure freeing of the detent in its socket. Thereafter the fulcrum which is provided by the shoulder 51 effects a substantial increase in the travel of the detent, thereby completing withdrawal of the detent from the socket. Upon release of the detent the mast may be readily lowered, this being aided by gravity and the action of the spring 17. When the mast is again elevated it is unnecessary to manipulate the lever 45. The detent which is held extended by the spring 43 to a position determined by the cams 48 will engage and ride over a rounded edge portion 54 on the tongue 23, the spring 43 causing the plunger to enter the socket 40 and lock the parts against further rela-

tive movement when the mast reaches an upright position.

I claim as my invention:

1. A collapsible antenna mast including a base member, a staff pivotally mounted on said base member and movable to elevated and lowered positions, a detent, resilient means for biasing said detent to lock said staff in said elevated position, a lever pivotally connected to said detent, resilient means for normally holding said lever in a retracted position, and a fulcrum about which said lever may pivot against the action of both of said resilient means to transmit a portion of its movement to said detent to thereby release said staff so that it may be lowered.

2. A collapsible antenna mast including a base member, a staff pivotally mounted on said base member and movable to elevated and lowered positions, a detent, resilient means for biasing said detent to lock said staff in said elevated position, a lever pivotally connected to said detent, resilient means for normally holding said lever in a retracted position, and means against which said lever acts to transmit a portion of its movement to said detent against the resistance offered by both of said resilient means to thereby release said staff so that it may be lowered, said lever being spaced from said last named means when held in said retracted position in the manner described.

3. A collapsible antenna mast including a base member, a staff pivotally mounted on said base member and movable to elevated and lowered positions, a detent for locking said staff in said elevated position, a lever having a pivotal connection with said detent, and means with which end and intermediate portions of said lever are successively engageable when the latter is actuated thereby to first free said detent and thereafter move it to a fully released position so that said staff may be lowered.

4. A collapsible antenna mast including a base member, a staff pivotally mounted on said base member and movable to elevated and lowered positions, a detent for locking said staff in said elevated position, a lever having a pivotal connection with said detent, means for normally holding said lever in a retracted position, means which the end of said lever initially engages when the latter is actuated to free said detent, and a fulcrum about which said lever thereafter pivots to complete the movement of said detent to a fully released position.

5. A collapsible antenna mast including a base member, a staff pivotally mounted on said base member and movable to elevated and lowered positions, a detent, a lever having a pivotal connection with said detent, means for normally holding said lever in a retracted position, means for providing a socket which said detent may enter with a wedging action to lock said staff against vibration in said elevated position, means which the end of said lever initially engages when said lever is actuated to free said detent in said socket, and a fulcrum about which said lever thereafter pivots to complete the movement of said detent to a fully released position.

6. A collapsible antenna mast including a base member, a staff pivotally mounted on said base member and movable to elevated and lowered positions, a detent, a lever having a pivotal connection with said detent, means for normally holding said lever in a retracted position, means for providing a socket which said detent may enter, resilient means for causing said detent to engage the walls of said socket with a wedging action to lock said staff against vibration in said elevated position, means which the end of said lever initially engages when said lever is actuated to free said detent in said socket, and a fulcrum about which said lever thereafter pivots to complete the movement of said detent to a fully released position.

7. A collapsible antenna mast including a base member, a staff pivotally mounted on said base member and movable to elevated and lowered positions, a detent, a lever having a pivotal connection with said detent, means for normally holding said lever in a retracted position, means for providing a socket which said detent may enter, resilient means for causing said detent to engage the walls of said socket with a wedging action to lock said staff against vibration in said elevated position, means which the end of said lever initially engages when said lever is actuated to free said detent in said socket, and a fulcrum about which said lever thereafter pivots to complete the movement of said detent to a fully released position, the end of said lever being spaced from said last named means when said lever occupies said retracted position.

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