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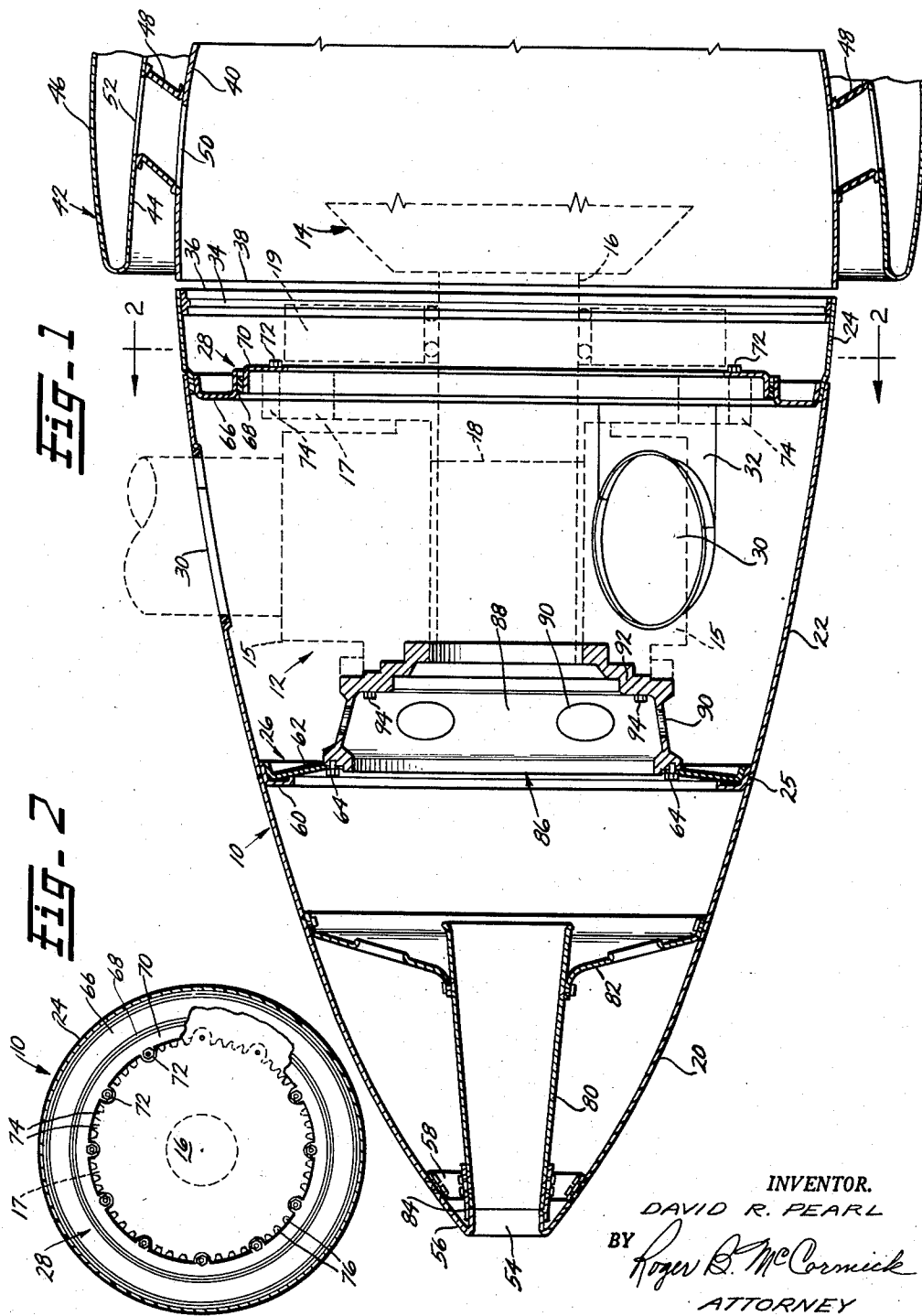
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AERONAUTICAL PROPELLER SPINNER

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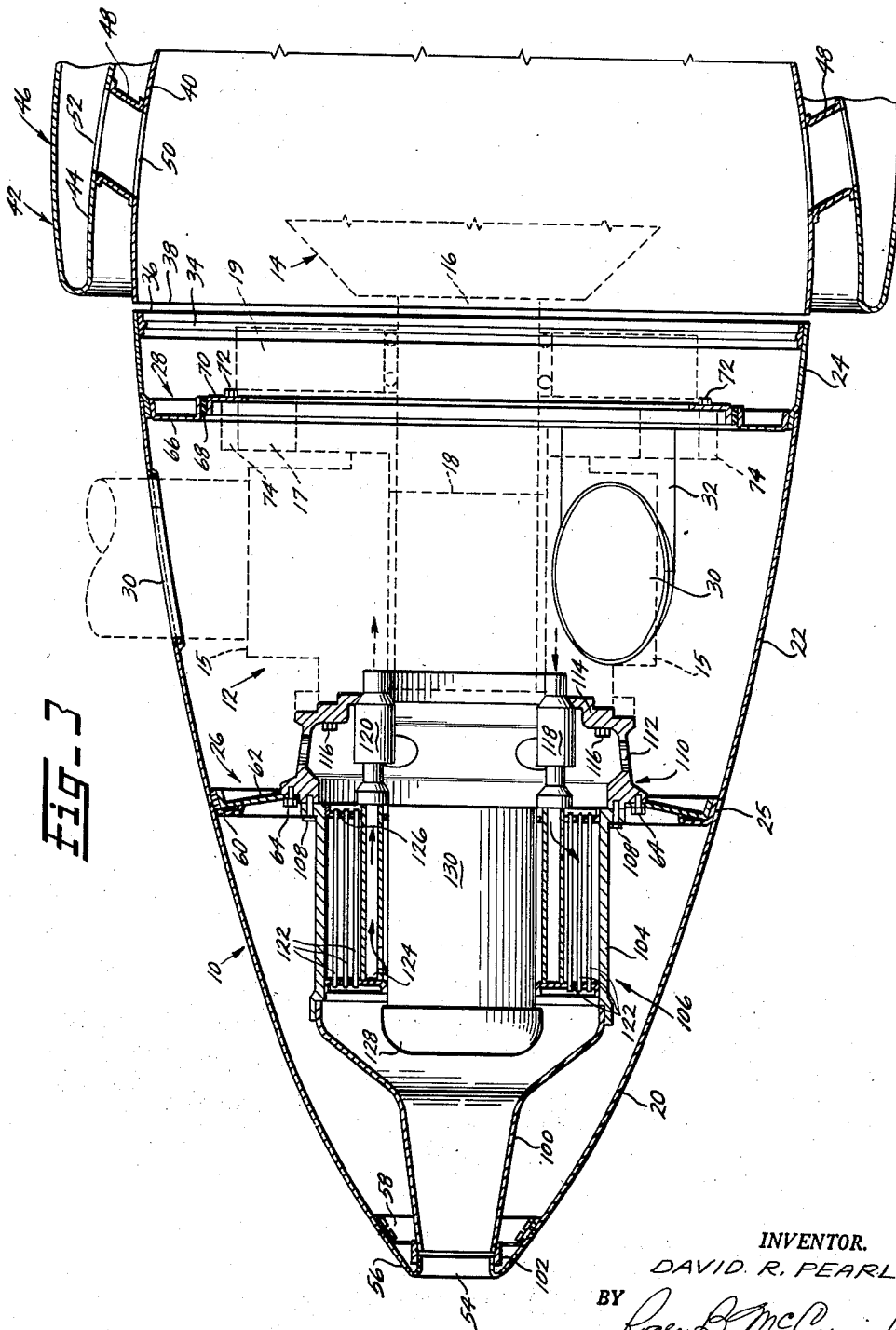
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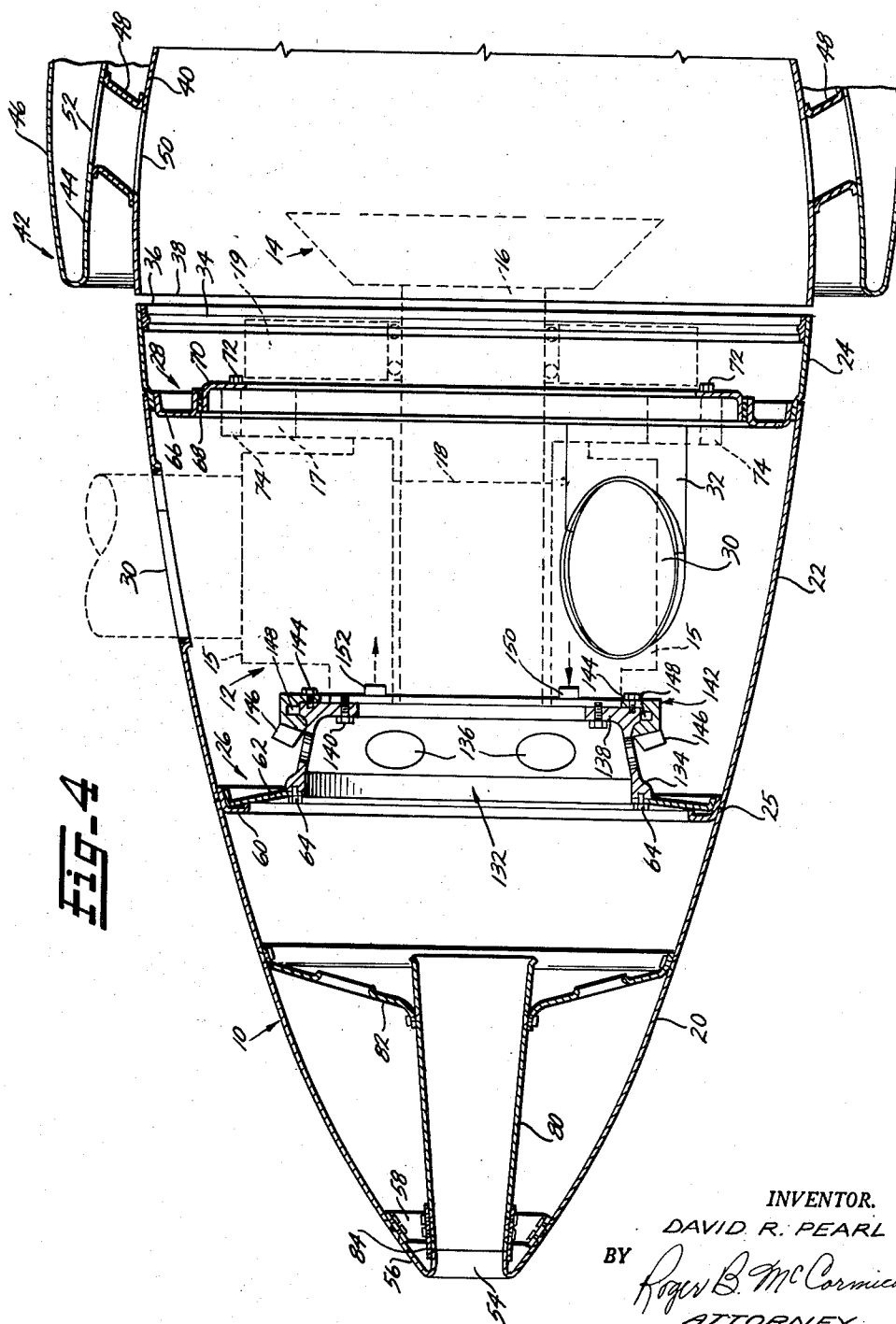
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AERONAUTICAL PROPELLER SPINNER

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7 Claims. (Cl. 170—160.23)

This invention relates to aeronautical propeller structure and, more specifically, to an improved aeronautical propeller spinner which is adapted to direct a cooling air stream over the hub section of a propeller assembly in intimate contact with portions of the said assembly containing the propeller control fluid.

In most engine and propeller installations there is no requirement for forced cooling of the propeller hub and the propeller control fluid, the normal flow of air over and around the central portion of the propeller assembly being sufficient for cooling purposes. However, aircraft and engine design trends, particularly in the turbo-propeller engine field, dictate a forced cooling requirement in the propeller assembly to assure optimum propeller control performance and efficiency.

It is the general object of this invention to provide a propeller spinner which will induce air flow in intimate contact or association with that portion of the propeller assembly containing the propeller control fluid which should be cooled to assure optimum propeller control performance.

A more specific object of the invention is to provide a propeller spinner having the aforementioned characteristics and which is adapted to discharge the cooling air stream at a selected location on the spinner shell and engine nacelle structure.

Other objects as well as advantages of the invention will become apparent to those skilled in the art from the following description of the attached drawings which illustrate three specific embodiments of the invention and in which,

Fig. 1 is a longitudinal cross-sectional view through a propeller spinner which is constructed in accordance with the present invention;

Fig. 2 is a transverse sectional view on reduced scale taken as indicated by the line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 1 showing an alternative form of construction; and

Fig. 4 is also similar to Fig. 1 and showing another alternative form of construction.

While three embodiments of the invention in an aeronautical propeller spinner have been shown in the various figures of the drawings, all embodiments include a generally frusto-conically shaped open-nose spinner shell indicated generally by the reference numeral 10. The shell 10 may be a one-piece structure but preferably comprises three sections each being frusto-conical in configuration and which can conveniently be secured together in end-to-end relationship. Each open-nose spinner shell 10 has one or more annular bulkheads for attaching the shell to the central portion of the propeller assembly in such a manner that the shell will embrace the shank portions of the radially extending propeller blades and will rotate with the propeller. In each embodiment, the trailing edge, or that end of the shell 10 opposite the open nose, will extend rearwardly of the propeller blades. In each embodiment of the invention there is also included a pedestal which is attached on

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the front central portion of the propeller assembly and to an annular bulkhead within the spinner shell and which has a plurality of generally radial openings which accommodate the ram air stream from the central nose opening of the shell to constrain the flow of the said air stream and direct it into intimate contact or association with the hub or central portion of the propeller assembly.

It will be readily understood as the description progresses that the improved spinner of this invention can be adapted to a variety of propeller assemblies whether they be of three or four-blade type. For purposes of illustration, the various embodiments of the propeller spinner have been shown in each case as mounted upon a three-blade propeller assembly which is shown in outline only and indicated generally by the reference numeral 12. There is also shown the front portion 14 of an exemplary aircraft engine of the turbo-propeller type which requires an annular air inlet. The propeller assembly 12 is connected to the engine 14 on a shaft 16 by means of an attaching nut 18. It will be unnecessary to describe the details of the propeller assembly 12 and the details of the engine structure 14, because such structure forms no part of the present invention. However, it should be observed that the propeller assembly 12 includes a hub from which a plurality of blade retaining arms 15, 15 extend and to which a propeller control fluid pump housing 17 is attached. The pump housing 17 is located rearwardly of the blade arms 15, 15 and rearwardly of the said pump housing, non-rotating support means 19 is provided for the propeller shaft 16.

With more specific reference to the spinner shell 10, as it is shown in each embodiment of the invention, it will be noted that the same comprises three frusto-conical sections, namely, a front section 20, an intermediate section 22, and a rear or trailing section 24 which are connected in end-to-end relationship. The front section 20 and the intermediate section 22 are joined in edge-abutting relationship at the line 25 on the rim of an annular bulkhead indicated generally by the reference numeral 26. The intermediate section 22 and the rear sections 24 are joined in edge-overlapping relationship on the rim of a bulkhead indicated generally by the reference numeral 28. More specifically, the front edge of the rear section 24 is offset radially inwardly so that the trailing edge of the intermediate section 22 will overlap the same. The sections 20, 22 and 24 are secured to the annular bulkheads 26 and 28 by conventional means (not shown). It is desirable to have the section 20 detachably secured to the bulkhead 26 by screws or other fastening means and to have the section 22 detachably secured to the bulkhead 28 by similar fastening means.

Each intermediate section 22 of the spinner shell 10 in the various embodiments of the invention is provided with a plurality of circumferentially spaced openings 30, 30 through which the blades of the propeller assembly project. Each opening 30 is defined in part by a detachable panel 32 extending from the trailing edge of the intermediate section 22 to the opening 30 so that, when the panels 32, 32 are removed, the shell 10 can be placed over the propeller hub from the front thereof. After the shell has been placed over the propeller hub the panels 32, 32 are attached by suitable fasteners to complete the openings 30, 30 surrounding the blades. A stiffening ring 34 is secured internally of the rear shell section 24 adjacent the trailing edge thereof in each embodiment of the invention. The ring 34 may be attached as by rivets or welding or the like and is preferably attached before the various sections of the shell are connected together on the bulkheads 26 and 28.

It will be observed that in each illustration of the in-

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vention the trailing edge 36 of the spinner shell 10 is spaced a slight distance forwardly of the leading edge 38 of a nacelle 40 which surrounds the engine 14. The nacelle 40 comprises a shell which does not rotate but which is substantially equal in diameter at its leading edge 38 to the diameter of the trailing edge 36 of the spinner shell 10. Accordingly, the engine nacelle 40 constitutes a rearward, non-rotating extension of the spinner shell 10 for a purpose to be fully described hereinafter. A cowl-
ing 42 surrounds the nacelle 40 and comprises an inner wall 44 and an outer wall 46 and there is space provided between the said inner and outer walls. The inner wall 44 of the cowl-
ing 42 surrounds the nacelle 40 in spaced relationship and is connected thereto by a plurality of hollow struts 48, 48 which are circumferentially spaced around the nacelle 40. The nacelle 40 is provided with an opening 50 to the interior of each hollow strut 48 and the inner wall 44 of the cowl-
ing 42 is provided with an opening 52 into the interior of each hollow strut 48.

It is an important feature of construction in the spinner shell 10 utilized in each embodiment of the invention that the front shell section 20 is provided with a substantial nose opening 54 which is defined by a generally annular but frustoconically shaped nose piece 56. The nose piece 56 has an inwardly or rearwardly turned flange so that the opening 54 into the shell 10 is surrounded by a substantially cylindrical wall. The trailing edge of the nose piece 56 is secured or connected with the front edge of the front section 20 of the shell 10 by means of rivets projecting from the said nose piece and the section 20 through a ring 58 located on the inner front edge of the section 20. The nose opening 54 is provided to admit a ram air stream into the spinner shell for circulating in intimate association with the central portion of the propeller assembly 12 and the propeller control fluid pump housing 17. As will be shown in greater detail hereinafter, the air stream is constrained to flow internally of the forward annular bulkhead 26 and through the pedestal to which it is attached and then over the propeller hub and around the blade arms 15 and over the pump housing 17 through the interior of the rearward annular bulkhead 28.

In each embodiment of the invention, the forward bulkhead 26 comprises an outer ring 60 and an inner ring 62. The outer ring 60 is of generally L-shaped cross-sectional configuration wherein one leg of the L comprises a relatively wide rim for the bulkhead 26 which rim engages the rearward and forward portions of the front and intermediate shell sections, respectively, along their line of abutment 25. The inner ring 62 is also generally L-shaped in cross section wherein one leg of the L defines a rim which is disposed within the rim on the outer ring 60. The fastening devices connecting the front and intermediate sections 20 and 22 of the shell extend through the rims on the outer and inner rings 60 and 62 forming the bulkhead 26. The other leg of the L-shaped inner ring 62 extends radially inwardly of the shell 10 and is provided with a large central opening around which a plurality of bolts 64, 64 are circumaxially spaced for attaching the bulkhead 26 to the front face of a pedestal which is detachably secured to the front or forward face of the central portion of the propeller hub assembly 12.

The rearward annular bulkhead 28 in each spinner embodiment shown includes a ring 66 of generally U-shaped cross-sectional configuration. The outer wall of the ring 66 engages the overlapped leading edge portion of the rear section 24 of the shell 10 and receives the fastening devices which extend through said forward portion of the rear section and the trailing edge portion of the intermediate section 22. A sealing ring or gasket 68 is cemented to the radially inner surface of the inner wall of the ring 66 and, when the shell 10 is placed over the propeller assembly 12, the radially inner surface of the sealing ring 68 engages the rim of an L-shaped support ring 70. The support ring 70 is attached as by bolts 72, 72 to the rear face of the pump housing 17. The bolts 72, 72 extend

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through radially inwardly projecting lugs on the support ring whereby the said ring surrounds the outer periphery of the pump housing. The said outer periphery of the pump housing has a plurality of radially extending cooling fins 74, 74 which extend to the inner periphery of the ring 70 and the channels 76, 76 are defined between adjacent fins 74, 74 for the flow of air.

From the foregoing general description of the spinner shell which is common to all embodiments shown, it should be understood that a ram air stream passing through the central nose opening 54 will be constrained to flow through the central opening in the forward annular bulkhead 26 and then over and around the hub section of the propeller assembly 12 and finally through the central opening in the support ring 70 for the rearward annular bulkhead 28. In passing through the support ring 70 the ram air stream will flow through the channels 76, 76 on the pump housing 17 and between the cooling fins 74, 74 provided thereon. In each embodiment of the spinner there is provided a pedestal, as has been previously mentioned, located at the opening of the forward bulkhead 26 and adapted to constrain and direct flow of the ram air stream. There are some differences in the pedestals utilized in the respective embodiments shown and each pedestal will be described in detail in connection with a description of each specific embodiment.

In each embodiment of the spinner there is also provided an internally located diffuser which is in direct communication with the nose opening 54 and which channels the ram air stream rearwardly in the spinner shell. The embodiment of the invention shown in Figs. 1 and 2 and the embodiment of the invention shown in Fig. 4 have a tube-like diffuser 80. The front end of the diffuser 80 equals the diameter of the nose opening 54 and abuts the internal flange on the nose piece 56. The rear end of the diffuser 80 is of greater diameter and is spaced forwardly of the forward annular bulkhead 28. The tube-like diffuser 80 is supported by a ring 82 which extends transversely of the shell 10 near the rear end of the diffuser and which has a rim riveted or otherwise secured internally of the shell and an inner peripheral portion which is riveted or otherwise secured to the diffuser. A sleeve 84 is secured as by rivets or the like to the front end of the diffuser 80 to project forwardly therefrom. The forwardly projecting portion of the sleeve 84 embraces the internal flange on the nose piece 56 so as to locate and offer support for the front end of the said diffuser.

With reference to the particular embodiment of the invention shown in Figs. 1 and 2, attention is directed to the pedestal 86 shown in Fig. 1. The said pedestal is generally annular and has a wide rim 88 provided with a plurality of circumferentially spaced openings 90, 90. The rear wall 92 of the said pedestal may be formed as shown or provided in any other suitable form for attachment to the front face of a propeller assembly. While the said rear wall 92 is shown as having a central opening about the same diameter as the diameter of the propeller shaft 16, said opening need not be provided or it can be closed by detachable means. In any event, there should be no air flow through the radially inner part of the pedestal 86 since the said pedestal is provided to direct air flow through its openings 90, 90 radially thereof. The rear wall of the propeller assembly 12 is detachably secured to the front face of the propeller assembly 12 as by a plurality of bolts 94, 94 and the inner ring 62 of the front bulkhead 26 is secured to the front face of the pedestal 86 by the previously mentioned bolts 64, 64.

It will be observed with particular reference to Fig. 1 that the ram air stream entering the nose opening 54 and passing through the diffuser 80 is directed into the pedestal 86 which is located in the central opening in the forward bulkhead 26. The ram air stream then passes radially of the pedestal 86 through the plurality of the openings 90, 90 for rearward flow within the shell 10 in intimate

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contact and association with the hub section of the propeller. Such flow will be accommodated around the blade arms 15, 15 and around the pump housing 17. The said blade arms and pump housing carry the propeller control fluid which is heated by propeller control operation. In passing through the rear bulkhead 28 and support ring 70, the air stream is constrained to flow through the channels 76, 76 defined between the cooling fins 74, 74 on the said pump housing to efficiently cool the propeller fluid.

It is obvious that air will not flow through the spinner in the aforementioned manner unless it can be discharged from the spinner. It can only be discharged from the spinner if the internal air pressure at the point of discharge is greater than the external air pressure. It will be readily understood by those skilled in the art that the pressure in the boundary layer of air surrounding the spinner will be higher at the nose than at the trailing edge 36 thereof. Therefore, if the ram air stream is to be discharged at the trailing edge 36 of the spinner shell, the pressure drop of the ram air flowing through the said shell must be less than the pressure drop at the boundary layer surrounding the shell. And, assuming that discharge is to take place at the trailing edge 36, the pressure differential at the said trailing edge must be sufficient to induce the volume of ram air flow necessary for the desired cooling effect on the propeller assembly and its control fluid. Accordingly, the openings 90, 90 in the pedestal 86 and the air flow openings provided between the cooling fins on the pump housing 17 must be related to the area of the nose opening 54 to control the pressure drop in ram air flow through the spinner so that the said drop will be a determinable amount less than the drop in the boundary layer of air in order to have discharge at the desired rate at the trailing edge.

In the installation shown in Fig. 1 of the drawings and in the other figures as well, the spinner is utilized on a propeller installation for a turbo-propeller engine 14 having an annular air inlet defined between the cowling 42 and the nacelle 40. In this type installation, it may be undesirable to discharge the ram air stream at the trailing edge 36 of the rotating spinner shell 10. Such trailing edge discharge may cause turbulence in the boundary layer air or the air immediately therearound and disrupt the smooth flow of air into the annular air inlet for the engine. Such being the case, it will be more desirable to discharge the ram air stream rearwardly of the annular air inlet. Accordingly, the pedestal openings and the cooling fin channels are related in size to the nose opening so that the pressure drop of the ram air stream will substantially equal the pressure drop in the boundary layer from the nose to the trailing edge of the rotating spinner shell 10. Since there will be substantially no difference in the internal and external pressures in the trailing edge 36, the ram air cannot be discharged at the trailing edge 36. Discharge may be accommodated at any convenient location in a rearward part of the airframe which is in communication with the opening provided between the walls 44 and 46 of the engine cowling 42. In other words, the ram air will flow through the shell into the nacelle 40 and through the hollow struts 48, 48 into the cowling for discharge at a remote location, not shown. The said discharge opening or openings in the airframe and the openings provided in the struts 48, 48 should also be related in size to the nose opening 54 to accommodate ram air flow therethrough at the rate necessary for cooling purposes. In designing or selecting the size of the nose opening and the various other openings for air flow purposes, such selection is preferably made with proper consideration given the anticipated aircraft speeds, the cruising speed being a guiding factor.

The embodiment of the invention shown in Fig. 3 is generally similar to the embodiment shown in Figs. 1 and 2 except that a heat exchanger has been added by connection to a slightly modified pedestal and a modified

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nose diffuser 100 is used in place of the previously described diffuser 80.

The diffuser 100 has a reduced diameter front end substantially equal to the diameter of the nose opening 54 and which is in communication therewith. That is, a sleeve 102 is secured to the internal flange on the nose piece 56 or to the front end of the diffuser 100 so as to extend over the two to connect them together. The rearward end of the diffuser 100 is substantially greater in diameter and is generally bell shaped. The said rearward end of the diffuser is nested within the forward end of the cylindrical housing 104 of a heat exchanger which is indicated generally by the numeral 106. The said heat exchanger is detachably connected as by bolts 108, 108 to the front face of a pedestal 110 which is generally similar to the previously described pedestal 86. That is, the pedestal 110 has a wide rim wherein a plurality of air flow openings 112, 112 are circumferentially located. The rearward wall 114 of the pedestal is secured to the front face of the propeller assembly 12 as by bolts 116, 116. The pedestal 110 differs from the previously described pedestal 86 in that it has a pair of forwardly and rearwardly extending conduit bosses 118 and 120 for accommodating the flow of propeller control fluid from and to the propeller assembly 12. More specifically, the conduit boss 118 receives hot propeller control fluid from the hub section of the propeller which fluid flows as indicated by the broken line arrow. After passing through the conduit boss 118, the fluid enters the heat exchanger 106 in the direction of the full line arrow and circulates therearound finally being discharged from the heat exchanger 106 in the direction of the arrows through the conduit boss 120. The control fluid is cooled within the heat exchanger 106 by the ram air stream which flows from the diffuser 100 through a plurality of small diameter tubes 122. The tubes 122 extend forwardly and rearwardly in the heat exchanger 106 and are arranged in an annular bank being supported in such position by a forward annular wall 124 and a rearward annular wall 126 closing the ends of the heat exchanger housing 104. The ram air stream is constrained or directed in an annular path into the flow tubes 122 by means of a baffle 128 detachably closing the forward end of the substantially cylindrical inner wall 130 of the heat exchanger 106. The ram air stream is discharged from the tubes 122, 122 into the pedestal 110 and flows through the openings 112, 112 therein and around the propeller assembly 12 and the pump housing 17 in the manner previously described.

It will be quite apparent that the embodiment of the invention shown in Fig. 3 provides for double effect cooling of the propeller control fluid as well as providing for cooling of the propeller assembly and particularly the blade arms 15, 15. That is, the propeller control fluid is not only cooled in the pump housing 17 but it is also cooled in the heat exchanger 106. Suitable conduits or passageways are provided in the hub of the propeller assembly 12 to accommodate flow of the control fluid into and out of the heat exchanger.

The spinner embodiment shown in Fig. 4 is also particularly adapted for double effect cooling of the propeller control fluid. In this last mentioned embodiment, a pedestal 132 is utilized which is generally similar to the previously described pedestals 86 and 110. That is, the pedestal 132 has a relatively wide rim 134 wherein a plurality of circumferentially spaced openings 136, 136 are located and the pedestal also has a back wall 138 which is connected with the front face of the propeller assembly 12 as by a plurality of bolts 140, 140.

In this embodiment of the invention, a relatively simple annular heat exchanger 142 is utilized. The annular heat exchanger 142 surrounds the pedestal 132 and has a radially inwardly directed flange secured to the rear wall 138 of the said pedestal as by the bolts 144, 144. The front face of the annular heat exchanger 142 is pro-

vided with a plurality of cooling fins 146, 146 which project forwardly sufficiently to surround the circumferentially spaced openings 136, 136. Accordingly, ram air passing through the openings 136, 136 flows around the cooling fins 146, 146 to reduce the temperature of the heat exchanger 142. The propeller control fluid is circulated through the heat exchanger 142 in one or more annular channels such as the channel 148, the control fluid being admitted from the propeller assembly in the direction of the broken line arrow by means of a conduit coupling 150 and the fluid being discharged to the propeller assembly in the direction of the broken line arrow through another conduit coupling 152.

In the last mentioned embodiment, similarly to the embodiment of Fig. 3, the propeller control fluid is not only cooled in the pump housing 17 but is also cooled by circulation through a heat exchanger exposed to the ram air stream. The said ram air stream circulates through or around the central portion of the propeller assembly 12 in the manner previously described so as to cool the parts of said assembly.

While the invention has been described with specific reference to three embodiments, it should be understood that other alternative forms of construction can be employed within the scope of the invention. Accordingly, it is not my intent to limit the invention to the particular embodiment shown, otherwise than indicated by the claims which follow.

I claim as my invention:

1. In a cooling spinner for an aeronautical propeller which has a central portion projecting forwardly and rearwardly of its blades, the combination comprising a generally frusto-conical shell surrounding the central portion of the propeller and detachably secured to the propeller for rotation therewith, said shell being open at both ends and having its smaller diameter end projecting forwardly of the propeller blades and having its larger diameter end projecting rearwardly of the blades, a first annular bulkhead extending transversely of said shell forwardly of the blades and forwardly of the central portion of the propeller and having a central opening, an annular wide rim pedestal connected between the forwardly projecting end of the central portion of the propeller and said first annular bulkhead and in the opening of the annular bulkhead and provided with at least one opening in its rim for the flow of ram air from the smaller diameter end of the shell, and a second annular bulkhead extending transversely of the said shell rearwardly of the blades and having a central opening surrounding the rear central portion of the propeller in closely spaced relationship through which opening said ram air flows after passing over the central portion of the propeller, the opening in said pedestal and the opening in said second annular bulkhead being provided to direct the ram air over the central portion of the propeller and said openings being related in size to the opening in the forward end of the shell to control the pressure drop of the ram air within said shell.

2. In a cooling spinner for an aeronautical propeller of the type having a hub, a plurality of controllable propeller blades extending radially therefrom, and a pump housing for blade control fluid located rearwardly of the blades, the combination comprising a generally frusto-conical spinner shell surrounding the propeller hub and secured for rotation with the propeller, said spinner shell having an open nose projecting forwardly of the propeller blades and having an open larger diameter rear end projecting rearwardly of the blades, a first annular bulkhead extending transversely of the spinner shell forwardly of the blades and forwardly of the hub, an annular wide rim pedestal connected between said first bulkhead and the propeller hub and having a plurality of openings in its rim for the passage of ram air from the open nose of the spinner shell, and a second annular bulkhead extending transversely of the spinner shell rearwardly of the

blades and having a central opening surrounding the pump housing in closely spaced relationship through which central opening the ram air passes after flowing over the propeller hub.

3. In a cooling spinner for an aeronautical propeller which has a central portion projecting forwardly and rearwardly of its blades, the combination comprising a generally frusto-conical spinner shell surrounding the central portion of the propeller and secured to the propeller for rotation therewith, said spinner shell having an open nose projecting forwardly of the propeller blades and having an open larger diameter rear end projecting rearwardly of the blades, a non-rotating shell disposed in closely spaced relationship to the rear end of the spinner shell and in substantial alignment therewith, said non-rotating shell being substantially equal in diameter to the rear end of the spinner shell, a first annular bulkhead extending transversely of the spinner shell forwardly of the blades and forwardly of the central portion of the propeller and having a central opening, an annular wide rim pedestal connected between said first bulkhead in the opening thereof and the forwardly projecting end of the central portion of the propeller and having a plurality of openings in its rim for the passage of ram air from the nose of the spinner shell in intimate association with the central portion of the propeller, and a second annular bulkhead extending transversely of the spinner shell rearwardly of the blades and having a central opening surrounding the rear central portion of the propeller in closely spaced relationship through which central opening the ram air passes after flowing over the central portion of the propeller, the said ram air flow openings in said pedestal and said second bulkhead being related in size to the opening in the nose of the spinner shell to maintain internal air pressure at the rear end of the spinner shell at no more than external air pressure at said rear end whereby the ram air will flow into said non-rotating shell.

4. In a cooling spinner for an aeronautical propeller of the type having a hub and a plurality of radially extending propeller blades and a pump housing for the propeller control fluid located rearwardly of the blades, the combination comprising a generally frusto-conical spinner shell surrounding the hub and secured to the propeller for rotation therewith, said spinner shell having an open nose projecting forwardly of the blades and forwardly of the hub and having an open larger diameter rear end projecting rearwardly of the pump housing, a non-rotating shell disposed in substantial alignment with and in closely spaced relationship to the rear end of the spinner shell, said non-rotating shell being substantially equal to the diameter of the rear end of the spinner shell, a first annular bulkhead extending transversely of the spinner shell forwardly of the blades and forwardly of the hub, an annular wide rim pedestal connected between said first bulkhead and the hub and having a plurality of openings in its rim for the passage of ram air from the nose of the spinner shell, and a second annular bulkhead extending transversely of the spinner shell rearwardly of the blades and having a central opening surrounding the pump housing in closely spaced relationship and through which central opening the ram air passes after flowing over the propeller hub, the said ram air flow openings in said pedestal and said second bulkhead being related in size to the nose opening of the spinner shell to maintain internal air pressure at the rear end of the spinner shell at no more than external air pressure at said rear end whereby the ram air will flow into said non-rotating shell.

5. In a cooling spinner for an aeronautical propeller of the type having a plurality of radially extending blades and a hub which projects forwardly and rearwardly of the blades, the combination comprising a generally frusto-conical spinner shell surrounding the hub and secured to the propeller for rotation therewith, said spinner shell

having an open nose projecting forwardly of the propeller blades and forwardly of the hub and having an open larger diameter rear end projecting rearwardly of the blades and rearwardly of the hub, a first annular bulkhead extending transversely of the spinner shell forwardly of the blades and forwardly of the hub and having a central opening, an annular wide rim pedestal connected between said first annular bulkhead in the opening thereof and the hub and having a plurality of openings in its rim for the passage of ram air from the nose of the spinner shell for flow over the hub, a diffuser located between said nose opening and said pedestal having a reduced diameter end adjacent said nose opening and a large diameter end adjacent said pedestal to direct the flow of ram air from said nose opening into said pedestal, and a second annular bulkhead extending transversely of the spinner shell rearwardly of the blades and having a central opening in closely spaced relationship to the rearwardly projecting portion of the hub of the propeller for the flow of ram air rearwardly of the spinner shell, the said ram air flow openings in said pedestal and said second bulkhead being arranged to maintain ram air flow in intimate contact with the propeller hub and being related in size to the nose opening to control the pressure drop of ram air within the shell.

6. In a cooling spinner for an aeronautical propeller of the type having a hub, a plurality of radially extending controllable blades, and means for pumping blade control fluid into the hub, the combination comprising a generally frusto-conical spinner shell surrounding the hub and secured to the propeller for rotation therewith, said spinner shell having an open nose projecting forwardly of the propeller blades and having an open larger diameter rear end projecting rearwardly of the blades, a first annular bulkhead extending transversely of the spinner shell forwardly of the blades and forwardly of the hub, an annular wide rim pedestal connected between said first bulkhead and the hub and having a plurality of openings in its rim for the passage of ram air from the nose of the spinner shell, a heat exchanger secured to said pedestal and connected to the propeller hub for the flow of control fluid into and out of the heat exchanger, said heat exchanger being located on said pedestal in the path of the ram air flowing from said nose opening through said pedestal openings,

and a second annular bulkhead extending transversely of the spinner shell rearwardly of the blades and having a central opening surrounding the rear portion of the hub in closely spaced relationship through which central opening the ram air flows after passing through the heat exchanger and over the propeller hub.

7. In a cooling spinner for an aeronautical propeller of the type having a hub, a plurality of radially extending controllable blades, means for pumping blade control fluid through said hub, and a housing for said pumping means located rearwardly of said blades, the combination comprising a generally frusto-conical spinner shell surrounding the hub and secured to the propeller for rotation therewith, said spinner shell having an open nose projecting forwardly of the propeller blades and forwardly of the hub and having an open larger diameter rear end projecting rearwardly of the blades and rearwardly of the pump housing, a first annular bulkhead extending transversely of the spinner shell forwardly of the blades and forwardly of the hub, an annular wide rim pedestal connected between said first annular bulkhead and said hub and having a plurality of openings in its rim for the passage of ram air from the nose of the spinner shell, a heat exchanger mounted on said pedestal and connected to said hub for the flow of blade control fluid, said heat exchanger being located in the path of ram air flowing from the nose opening through the pedestal openings, and a second annular bulkhead extending transversely of the spinner shell rearwardly of the blades and having a central opening surrounding the pump housing in closely spaced relationship through which central opening the ram air flows after passing through said pedestal and said heat exchanger and after passing over said hub.

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