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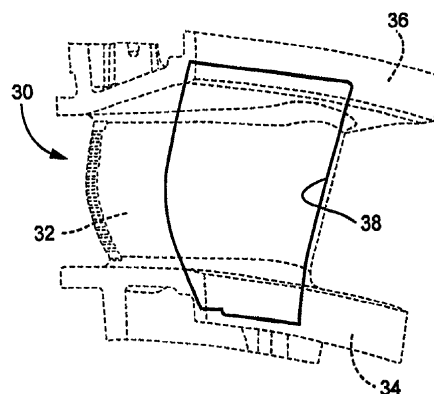
权利要求书 10 页 说明书 15 页 附图 2 页

[54] 发明名称

涡轮喷嘴机翼的内部芯轮廓

[57] 摘要

第一级喷嘴机翼(32)具有内部芯轮廓(38)，其大致与在表格 I 中提出的 X、Y 和 Z 笛卡儿坐标值一致，其中，X、Y 和 Z 值以英寸表示。X 和 Y 值是距离，当由平滑连续的弧连接时，其限定在每个径向距离 Z 处的内部芯轮廓部分。在每个距离 Z 处的轮廓部分相互平滑连接，以形成完整的内部芯轮廓。X、Y 和 Z 距离作为相同的常数或者数字的函数可按比例变化，以提供一种按比例增加或者按比例减小的内部芯轮廓。由 X、Y 和 Z 距离给定的额定内部芯轮廓(38)位于在垂直于任何内部芯表面位置的方向上的 ± 0.030 英寸的包络中。



1. 一种涡轮喷嘴段(30), 其包括内部(34)和外部(36)平台, 以及在所述平台之间延伸的机翼(32), 所述机翼具有内部额定芯轮廓(38), 其与在表格 I 中提出的 X、Y 和 Z 笛卡儿坐标值一致, 其中, Z 值是从涡轮轴线到垂直于半径延伸的平面的径向距离, 以及其中, X 和 Y 值是以英寸表示的距离, 当由平滑连续的弧连接时, 其限定在沿着机翼的每个距离 Z 处的内部芯轮廓部分, 在 Z 距离处的轮廓部分相互平滑连接, 以形成所述机翼内部芯轮廓。

2. 根据权利要求 1 所述的涡轮喷嘴段, 形成涡轮的第一级的部分。

3. 根据权利要求 1 所述的涡轮喷嘴段, 其特征在于, 所述内部芯轮廓(38)位于在垂直于任何内部芯表面位置的方向上的 ± 0.030 英寸内的包络中。

4. 根据权利要求 1 所述的涡轮喷嘴段, 其特征在于, 所述内部额定芯轮廓(38)的至少一部分与在表格 I 中提出的在 22.200 和 25.050 的 Z 值限制之间的 X、Y 和 Z 笛卡儿坐标值一致, 其中, 在所述限制之间的所述 Z 值是从涡轮轴线到垂直于半径延伸的平面的径向距离, 以及其中, X 和 Y 值是以英寸表示的距离, 当由平滑连续的弧连接时, 其限定在所述 Z 值限制之间在沿着机翼的每个距离 Z 处的内部芯轮廓部分, 在所述限制之间的 Z 距离处的轮廓部分相互平滑连接, 以形成所述机翼内部芯轮廓。

5. 根据权利要求 4 所述的涡轮喷嘴段, 形成涡轮的第一级的部分。

6. 根据权利要求 4 所述的涡轮喷嘴段, 其特征在于, 所述内部芯轮廓(38)位于在垂直于任何内部芯表面位置的方向上的 ± 0.030 英寸内的包络中。

7. 根据权利要求 4 所述的涡轮喷嘴段, 其特征在于, X、Y 和 Z 距离作为相同的常数或者数字的函数可按比例变化, 以提供一种按比例增加或者按比例减小的内部芯轮廓(38)。

8. 一种涡轮, 其包括以围绕涡轮的轴线的圆周阵列设置的多个喷嘴段(30), 每个所述喷嘴段包括内部(34)和外部(36)平台, 以及在所述平台之间延伸的至少一个机翼, 每个所述机翼具有内部额定芯轮廓(38), 其至少一部分与在表格 I 中提出的在 22.200 和 25.050 的 Z 值限制之间的 X、Y 和 Z 笛卡儿坐标值一致, 其中, 在所述限制之

间的所述 Z 值是从涡轮轴线到垂直于半径延伸的平面的径向距离，以及其中， X 和 Y 值是以英寸表示的距离，当由平滑连续的弧连接时，其限定在所述 Z 值限制之间在沿着机翼的每个距离 Z 处的内部芯轮廓部分，在所述限制之间的 Z 距离处的轮廓部分相互平滑连接，以形成所述机翼内部芯轮廓。

9. 根据权利要求 8 所述的涡轮，其特征在于，所述喷嘴段形成涡轮的第一级的部分。

10. 根据权利要求 8 所述的涡轮，其特征在于，所述内部芯轮廓 (38) 位于在垂直于任何内部芯表面位置的方向上的 ± 0.030 英寸内的包络中。

权利要求书的附件:

表格I

X	Y	Z	X	Y	Z	X	Y	Z
-0.582	-2.413	21.250	-1.406	-3.884	21.250	-2.385	-3.350	21.250
-0.587	-2.466	21.250	-1.412	-2.397	21.250	-2.391	-4.162	21.250
-0.591	-2.361	21.250	-1.433	-3.930	21.250	-2.417	-3.392	21.250
-0.604	-2.516	21.250	-1.458	-2.423	21.250	-2.435	-4.134	21.250
-0.611	-2.312	21.250	-1.459	-3.976	21.250	-2.448	-3.435	21.250
-0.632	-2.560	21.250	-1.486	-4.021	21.250	-2.475	-4.099	21.250
-0.641	-2.269	21.250	-1.504	-2.449	21.250	-2.479	-3.478	21.250
-0.662	-2.604	21.250	-1.514	-4.067	21.250	-2.510	-4.059	21.250
-0.679	-2.233	21.250	-1.542	-4.111	21.250	-2.510	-3.520	21.250
-0.692	-2.648	21.250	-1.549	-2.476	21.250	-2.539	-4.015	21.250
-0.721	-2.692	21.250	-1.571	-4.155	21.250	-2.540	-3.564	21.250
-0.724	-2.205	21.250	-1.594	-2.505	21.250	-2.562	-3.967	21.250
-0.750	-2.736	21.250	-1.602	-4.199	21.250	-2.567	-3.610	21.250
-0.773	-2.185	21.250	-1.634	-4.241	21.250	-2.581	-3.918	21.250
-0.779	-2.781	21.250	-1.638	-2.534	21.250	-2.588	-3.658	21.250
-0.807	-2.826	21.250	-1.669	-4.280	21.250	-2.588	-3.658	21.250
-0.825	-2.174	21.250	-1.681	-2.565	21.250	-2.595	-3.867	21.250
-0.834	-2.871	21.250	-1.708	-4.316	21.250	-2.602	-3.709	21.250
-0.862	-2.916	21.250	-1.723	-2.597	21.250	-2.604	-3.815	21.250
-0.877	-2.173	21.250	-1.752	-4.345	21.250	-2.607	-3.762	21.250
-0.889	-2.961	21.250	-1.764	-2.630	21.250	-0.555	-2.141	21.725
-0.916	-3.007	21.250	-1.801	-4.364	21.250	-0.564	-2.197	21.725
-0.930	-2.181	21.250	-1.804	-2.665	21.250	-0.565	-2.086	21.725
-0.943	-3.052	21.250	-1.843	-2.701	21.250	-0.585	-2.250	21.725
-0.970	-3.098	21.250	-1.853	-4.372	21.250	-0.594	-2.037	21.725
-0.980	-2.198	21.250	-1.880	-2.738	21.250	-0.607	-2.303	21.725
-0.997	-3.143	21.250	-1.906	-4.369	21.250	-0.628	-2.355	21.725
-1.023	-3.189	21.250	-1.917	-2.776	21.250	-0.637	-2.000	21.725
-1.028	-2.219	21.250	-1.953	-2.815	21.250	-0.649	-2.408	21.725
-1.050	-3.235	21.250	-1.958	-4.359	21.250	-0.671	-2.461	21.725
-1.076	-3.281	21.250	-1.989	-2.854	21.250	-0.688	-1.975	21.725
-1.077	-2.239	21.250	-2.008	-4.343	21.250	-0.692	-2.513	21.725
-1.101	-3.327	21.250	-2.024	-2.894	21.250	-0.714	-2.566	21.725
-1.126	-2.260	21.250	-2.058	-4.324	21.250	-0.735	-2.619	21.725
-1.127	-3.374	21.250	-2.059	-2.933	21.250	-0.744	-1.966	21.725
-1.152	-3.421	21.250	-2.093	-2.974	21.250	-0.757	-2.671	21.725
-1.174	-2.281	21.250	-2.106	-4.302	21.250	-0.778	-2.724	21.725
-1.177	-3.467	21.250	-2.127	-3.015	21.250	-0.800	-2.777	21.725
-1.202	-3.514	21.250	-2.154	-4.279	21.250	-0.800	-1.972	21.725
-1.222	-2.303	21.250	-2.160	-3.056	21.250	-0.821	-2.829	21.725
-1.227	-3.560	21.250	-2.193	-3.097	21.250	-0.842	-2.882	21.725
-1.252	-3.607	21.250	-2.201	-4.255	21.250	-0.853	-1.993	21.725
-1.270	-2.326	21.250	-2.226	-3.139	21.250	-0.864	-2.935	21.725
-1.278	-3.653	21.250	-2.248	-4.231	21.250	-0.885	-2.987	21.725
-1.303	-3.699	21.250	-2.258	-3.180	21.250	-0.897	-2.028	21.725
-1.318	-2.349	21.250	-2.290	-3.223	21.250	-0.907	-3.040	21.725
-1.329	-3.746	21.250	-2.295	-4.208	21.250	-0.928	-3.093	21.725

X	Y	Z	X	Y	Z	X	Y	Z
-0.983	-2.103	21.725	-1.899	-2.955	21.725	-0.678	-2.351	22.200
-0.993	-3.251	21.725	-1.919	-4.432	21.725	-0.682	-1.761	22.200
-1.014	-3.303	21.725	-1.938	-2.996	21.725	-0.694	-2.411	22.200
-1.026	-2.141	21.725	-1.976	-4.429	21.725	-0.710	-2.470	22.200
-1.036	-3.356	21.725	-1.977	-3.038	21.725	-0.726	-2.529	22.200
-1.058	-3.408	21.725	-2.015	-3.080	21.725	-0.742	-2.588	22.200
-1.069	-2.178	21.725	-2.032	-4.421	21.725	-0.742	-1.768	22.200
-1.080	-3.461	21.725	-2.054	-3.122	21.725	-0.758	-2.647	22.200
-1.102	-3.513	21.725	-2.088	-4.410	21.725	-0.775	-2.706	22.200
-1.112	-2.215	21.725	-2.092	-3.164	21.725	-0.791	-2.765	22.200
-1.125	-3.565	21.725	-2.130	-3.206	21.725	-0.794	-1.799	22.200
-1.148	-3.618	21.725	-2.143	-4.395	21.725	-0.808	-2.824	22.200
-1.155	-2.253	21.725	-2.168	-3.248	21.725	-0.825	-2.883	22.200
-1.171	-3.670	21.725	-2.197	-4.378	21.725	-0.831	-1.848	22.200
-1.194	-3.721	21.725	-2.206	-3.291	21.725	-0.842	-2.942	22.200
-1.198	-2.290	21.725	-2.243	-3.334	21.725	-0.859	-3.000	22.200
-1.218	-3.773	21.725	-2.250	-4.358	21.725	-0.865	-1.899	22.200
-1.240	-2.327	21.725	-2.280	-3.377	21.725	-0.877	-3.059	22.200
-1.243	-3.824	21.725	-2.303	-4.337	21.725	-0.895	-3.118	22.200
-1.268	-3.875	21.725	-2.317	-3.420	21.725	-0.900	-1.949	22.200
-1.283	-2.365	21.725	-2.354	-3.464	21.725	-0.913	-3.176	22.200
-1.294	-3.926	21.725	-2.354	-4.313	21.725	-0.931	-3.235	22.200
-1.321	-3.976	21.725	-2.390	-3.507	21.725	-0.936	-1.999	22.200
-1.326	-2.403	21.725	-2.404	-4.285	21.725	-0.950	-3.293	22.200
-1.350	-4.025	21.725	-2.426	-3.551	21.725	-0.969	-3.351	22.200
-1.368	-2.440	21.725	-2.450	-4.252	21.725	-0.971	-2.049	22.200
-1.379	-4.074	21.725	-2.450	-4.252	21.725	-0.989	-3.409	22.200
-1.410	-4.121	21.725	-2.463	-3.595	21.725	-1.007	-2.099	22.200
-1.411	-2.478	21.725	-2.491	-4.213	21.725	-1.009	-3.467	22.200
-1.443	-4.168	21.725	-2.498	-3.639	21.725	-1.030	-3.524	22.200
-1.453	-2.517	21.725	-2.525	-4.167	21.725	-1.043	-2.148	22.200
-1.478	-4.212	21.725	-2.532	-3.685	21.725	-1.051	-3.582	22.200
-1.494	-2.555	21.725	-2.552	-4.117	21.725	-1.073	-3.639	22.200
-1.516	-4.255	21.725	-2.562	-3.733	21.725	-1.080	-2.197	22.200
-1.536	-2.594	21.725	-2.574	-4.064	21.725	-1.096	-3.696	22.200
-1.556	-4.295	21.725	-2.585	-3.785	21.725	-1.117	-2.246	22.200
-1.577	-2.633	21.725	-2.589	-4.010	21.725	-1.119	-3.753	22.200
-1.600	-4.331	21.725	-2.599	-3.840	21.725	-1.143	-3.809	22.200
-1.618	-2.672	21.725	-2.599	-3.954	21.725	-1.155	-2.294	22.200
-1.647	-4.363	21.725	-2.603	-3.897	21.725	-1.168	-3.865	22.200
-1.659	-2.712	21.725	-0.559	-1.877	22.200	-1.192	-2.343	22.200
-1.697	-4.390	21.725	-0.568	-1.937	22.200	-1.195	-3.920	22.200
-1.700	-2.752	21.725	-0.579	-1.820	22.200	-1.222	-3.975	22.200
-1.740	-2.792	21.725	-0.584	-1.996	22.200	-1.230	-2.391	22.200
-1.750	-4.410	21.725	-0.599	-2.055	22.200	-1.251	-4.029	22.200
-1.780	-2.832	21.725	-0.615	-2.115	22.200	-1.269	-2.438	22.200
-1.806	-4.424	21.725	-0.624	-1.779	22.200	-1.281	-4.082	22.200

X	Y	Z	X	Y	Z	X	Y	Z
-1.346	-4.186	22.200	-2.509	-4.296	22.200	-1.017	-2.034	22.675
-1.382	-4.235	22.200	-2.520	-3.783	22.200	-1.023	-3.527	22.675
-1.386	-2.580	22.200	-2.542	-4.244	22.200	-1.043	-3.590	22.675
-1.420	-4.283	22.200	-2.554	-3.833	22.200	-1.049	-2.092	22.675
-1.425	-2.627	22.200	-2.567	-4.189	22.200	-1.064	-3.652	22.675
-1.461	-4.329	22.200	-2.581	-3.888	22.200	-1.082	-2.149	22.675
-1.465	-2.673	22.200	-2.585	-4.130	22.200	-1.086	-3.714	22.675
-1.505	-4.371	22.200	-2.596	-3.948	22.200	-1.108	-3.776	22.675
-1.506	-2.719	22.200	-2.596	-4.070	22.200	-1.116	-2.205	22.675
-1.546	-2.765	22.200	-2.601	-4.009	22.200	-1.132	-3.838	22.675
-1.553	-4.410	22.200	-0.578	-1.672	22.675	-1.150	-2.262	22.675
-1.587	-2.811	22.200	-0.590	-1.609	22.675	-1.156	-3.899	22.675
-1.603	-4.444	22.200	-0.591	-1.737	22.675	-1.181	-3.960	22.675
-1.629	-2.856	22.200	-0.604	-1.801	22.675	-1.184	-2.318	22.675
-1.658	-4.473	22.200	-0.617	-1.866	22.675	-1.208	-4.020	22.675
-1.670	-2.901	22.200	-0.630	-1.930	22.675	-1.219	-2.374	22.675
-1.712	-2.945	22.200	-0.638	-1.564	22.675	-1.236	-4.080	22.675
-1.715	-4.496	22.200	-0.643	-1.995	22.675	-1.254	-2.429	22.675
-1.754	-2.990	22.200	-0.656	-2.059	22.675	-1.265	-4.139	22.675
-1.774	-4.512	22.200	-0.670	-2.124	22.675	-1.290	-2.485	22.675
-1.796	-3.034	22.200	-0.683	-2.188	22.675	-1.296	-4.197	22.675
-1.834	-4.521	22.200	-0.697	-2.252	22.675	-1.326	-2.540	22.675
-1.839	-3.078	22.200	-0.701	-1.552	22.675	-1.328	-4.254	22.675
-1.882	-3.122	22.200	-0.711	-2.317	22.675	-1.363	-2.594	22.675
-1.895	-4.525	22.200	-0.725	-2.381	22.675	-1.363	-4.310	22.675
-1.925	-3.166	22.200	-0.740	-2.445	22.675	-1.400	-2.648	22.675
-1.956	-4.524	22.200	-0.754	-2.510	22.675	-1.400	-4.364	22.675
-1.968	-3.210	22.200	-0.762	-1.575	22.675	-1.438	-2.702	22.675
-2.011	-3.253	22.200	-0.769	-2.574	22.675	-1.440	-4.417	22.675
-2.017	-4.519	22.200	-0.784	-2.638	22.675	-1.476	-2.756	22.675
-2.054	-3.297	22.200	-0.799	-2.702	22.675	-1.483	-4.466	22.675
-2.078	-4.509	22.200	-0.801	-1.627	22.675	-1.515	-2.809	22.675
-2.097	-3.340	22.200	-0.814	-2.766	22.675	-1.530	-4.513	22.675
-2.138	-4.496	22.200	-0.830	-2.830	22.675	-1.555	-2.861	22.675
-2.140	-3.384	22.200	-0.831	-1.686	22.675	-1.581	-4.554	22.675
-2.183	-3.427	22.200	-0.845	-2.894	22.675	-1.595	-2.913	22.675
-2.197	-4.479	22.200	-0.861	-1.745	22.675	-1.636	-4.590	22.675
-2.226	-3.471	22.200	-0.862	-2.958	22.675	-1.636	-2.965	22.675
-2.254	-4.459	22.200	-0.878	-3.021	22.675	-1.678	-3.016	22.675
-2.269	-3.515	22.200	-0.891	-1.803	22.675	-1.696	-4.618	22.675
-2.311	-4.436	22.200	-0.895	-3.085	22.675	-1.721	-3.066	22.675
-2.311	-3.559	22.200	-0.912	-3.149	22.675	-1.759	-4.637	22.675
-2.354	-3.603	22.200	-0.922	-1.861	22.675	-1.764	-3.116	22.675
-2.366	-4.409	22.200	-0.929	-3.212	22.675	-1.807	-3.165	22.675
-2.396	-3.647	22.200	-0.947	-3.275	22.675	-1.824	-4.647	22.675
-2.419	-4.378	22.200	-0.953	-1.919	22.675	-1.852	-3.213	22.675
-2.438	-3.691	22.200	-0.965	-3.339	22.675	-1.889	-4.648	22.675

X	Y	Z	X	Y	Z	X	Y	Z
-1.990	-3.355	22.675	-0.789	-1.523	23.150	-1.454	-2.815	23.150
-2.019	-4.629	22.675	-0.795	-2.684	23.150	-1.472	-4.561	23.150
-2.037	-3.400	22.675	-0.810	-2.752	23.150	-1.493	-2.872	23.150
-2.083	-4.612	22.675	-0.816	-1.587	23.150	-1.516	-4.615	23.150
-2.085	-3.446	22.675	-0.825	-2.819	23.150	-1.533	-2.929	23.150
-2.133	-3.490	22.675	-0.841	-2.887	23.150	-1.565	-4.664	23.150
-2.145	-4.591	22.675	-0.844	-1.651	23.150	-1.573	-2.985	23.150
-2.182	-3.535	22.675	-0.857	-2.954	23.150	-1.615	-3.041	23.150
-2.206	-4.566	22.675	-0.871	-1.714	23.150	-1.618	-4.708	23.150
-2.231	-3.579	22.675	-0.873	-3.021	23.150	-1.657	-3.095	23.150
-2.266	-4.538	22.675	-0.890	-3.089	23.150	-1.676	-4.746	23.150
-2.280	-3.622	22.675	-0.899	-1.778	23.150	-1.701	-3.149	23.150
-2.324	-4.508	22.675	-0.907	-3.156	23.150	-1.740	-4.773	23.150
-2.329	-3.666	22.675	-0.924	-3.223	23.150	-1.745	-3.203	23.150
-2.378	-3.710	22.675	-0.928	-1.841	23.150	-1.790	-3.255	23.150
-2.381	-4.475	22.675	-0.942	-3.290	23.150	-1.807	-4.788	23.150
-2.426	-3.755	22.675	-0.957	-1.904	23.150	-1.837	-3.306	23.150
-2.435	-4.438	22.675	-0.961	-3.357	23.150	-1.876	-4.791	23.150
-2.474	-3.800	22.675	-0.979	-3.423	23.150	-1.884	-3.357	23.150
-2.485	-4.394	22.675	-0.986	-1.967	23.150	-1.932	-3.407	23.150
-2.518	-3.849	22.675	-0.999	-3.490	23.150	-1.945	-4.783	23.150
-2.526	-4.343	22.675	-1.016	-2.029	23.150	-1.981	-3.456	23.150
-2.555	-3.903	22.675	-1.019	-3.556	23.150	-2.012	-4.766	23.150
-2.555	-3.903	22.675	-1.039	-3.622	23.150	-2.031	-3.503	23.150
-2.557	-4.285	22.675	-1.046	-2.092	23.150	-2.077	-4.743	23.150
-2.579	-4.223	22.675	-1.060	-3.688	23.150	-2.082	-3.551	23.150
-2.582	-3.963	22.675	-1.076	-2.154	23.150	-2.134	-3.597	23.150
-2.592	-4.159	22.675	-1.082	-3.754	23.150	-2.141	-4.715	23.150
-2.595	-4.028	22.675	-1.105	-3.819	23.150	-2.186	-3.643	23.150
-2.598	-4.093	22.675	-1.108	-2.216	23.150	-2.202	-4.683	23.150
-0.583	-1.527	23.150	-1.128	-3.884	23.150	-2.238	-3.687	23.150
-0.587	-1.596	23.150	-1.139	-2.277	23.150	-2.262	-4.648	23.150
-0.598	-1.664	23.150	-1.153	-3.949	23.150	-2.291	-3.732	23.150
-0.610	-1.732	23.150	-1.172	-2.338	23.150	-2.321	-4.611	23.150
-0.621	-1.470	23.150	-1.178	-4.014	23.150	-2.345	-3.776	23.150
-0.622	-1.800	23.150	-1.204	-4.078	23.150	-2.378	-4.573	23.150
-0.634	-1.869	23.150	-1.205	-2.399	23.150	-2.398	-3.821	23.150
-0.646	-1.937	23.150	-1.232	-4.141	23.150	-2.434	-4.532	23.150
-0.659	-2.005	23.150	-1.238	-2.460	23.150	-2.451	-3.866	23.150
-0.672	-2.073	23.150	-1.261	-4.204	23.150	-2.485	-4.485	23.150
-0.684	-2.141	23.150	-1.272	-2.520	23.150	-2.500	-3.914	23.150
-0.685	-1.448	23.150	-1.291	-4.267	23.150	-2.529	-4.431	23.150
-0.697	-2.209	23.150	-1.307	-2.580	23.150	-2.543	-3.969	23.150
-0.711	-2.277	23.150	-1.323	-4.328	23.150	-2.543	-3.969	23.150
-0.724	-2.345	23.150	-1.343	-2.639	23.150	-2.560	-4.370	23.150
-0.738	-2.413	23.150	-1.356	-4.389	23.150	-2.573	-4.031	23.150
-0.750	-1.468	23.150	-1.379	-2.698	23.150	-2.581	-4.304	23.150

X	Y	Z	X	Y	Z	X	Y	Z
-0.566	-1.586	23.625	-1.110	-3.950	23.625	-2.226	-3.794	23.625
-0.567	-1.515	23.625	-1.115	-2.326	23.625	-2.246	-4.780	23.625
-0.578	-1.656	23.625	-1.135	-4.017	23.625	-2.282	-3.837	23.625
-0.590	-1.727	23.625	-1.147	-2.390	23.625	-2.305	-4.739	23.625
-0.602	-1.797	23.625	-1.160	-4.084	23.625	-2.339	-3.881	23.625
-0.610	-1.460	23.625	-1.179	-2.454	23.625	-2.362	-4.696	23.625
-0.614	-1.868	23.625	-1.186	-4.151	23.625	-2.396	-3.924	23.625
-0.626	-1.938	23.625	-1.212	-2.517	23.625	-2.418	-4.652	23.625
-0.639	-2.008	23.625	-1.213	-4.217	23.625	-2.452	-3.968	23.625
-0.652	-2.079	23.625	-1.242	-4.282	23.625	-2.471	-4.604	23.625
-0.665	-2.149	23.625	-1.246	-2.580	23.625	-2.504	-4.017	23.625
-0.678	-2.219	23.625	-1.272	-4.347	23.625	-2.519	-4.551	23.625
-0.679	-1.445	23.625	-1.280	-2.643	23.625	-2.519	-4.551	23.625
-0.691	-2.289	23.625	-1.304	-4.411	23.625	-2.546	-4.074	23.625
-0.705	-2.359	23.625	-1.315	-2.705	23.625	-2.555	-4.489	23.625
-0.718	-2.430	23.625	-1.337	-4.474	23.625	-2.575	-4.140	23.625
-0.732	-2.500	23.625	-1.351	-2.767	23.625	-2.579	-4.422	23.625
-0.741	-1.477	23.625	-1.372	-4.536	23.625	-2.590	-4.209	23.625
-0.747	-2.570	23.625	-1.388	-2.828	23.625	-2.591	-4.352	23.625
-0.761	-2.640	23.625	-1.410	-4.597	23.625	-2.595	-4.281	23.625
-0.773	-1.540	23.625	-1.426	-2.889	23.625	-0.522	-1.602	24.100
-0.776	-2.709	23.625	-1.451	-4.656	23.625	-0.531	-1.674	24.100
-0.791	-2.779	23.625	-1.464	-2.949	23.625	-0.544	-1.746	24.100
-0.799	-1.607	23.625	-1.494	-4.712	23.625	-0.548	-1.535	24.100
-0.807	-2.849	23.625	-1.503	-3.009	23.625	-0.556	-1.818	24.100
-0.822	-2.919	23.625	-1.541	-4.766	23.625	-0.569	-1.890	24.100
-0.826	-1.673	23.625	-1.543	-3.068	23.625	-0.581	-1.962	24.100
-0.838	-2.988	23.625	-1.585	-3.126	23.625	-0.594	-2.034	24.100
-0.853	-1.739	23.625	-1.593	-4.815	23.625	-0.608	-2.106	24.100
-0.855	-3.058	23.625	-1.627	-3.184	23.625	-0.609	-1.497	24.100
-0.872	-3.127	23.625	-1.650	-4.858	23.625	-0.621	-2.178	24.100
-0.880	-1.805	23.625	-1.670	-3.241	23.625	-0.634	-2.250	24.100
-0.889	-3.197	23.625	-1.712	-4.893	23.625	-0.648	-2.322	24.100
-0.906	-3.266	23.625	-1.715	-3.296	23.625	-0.662	-2.394	24.100
-0.908	-1.871	23.625	-1.761	-3.351	23.625	-0.676	-2.465	24.100
-0.924	-3.335	23.625	-1.780	-4.916	23.625	-0.681	-1.504	24.100
-0.936	-1.937	23.625	-1.808	-3.405	23.625	-0.691	-2.537	24.100
-0.943	-3.404	23.625	-1.850	-4.926	23.625	-0.706	-2.609	24.100
-0.962	-3.473	23.625	-1.856	-3.458	23.625	-0.721	-2.680	24.100
-0.964	-2.002	23.625	-1.905	-3.509	23.625	-0.733	-1.554	24.100
-0.981	-3.542	23.625	-1.922	-4.922	23.625	-0.736	-2.752	24.100
-0.993	-2.068	23.625	-1.956	-3.560	23.625	-0.752	-2.823	24.100
-1.001	-3.610	23.625	-1.991	-4.907	23.625	-0.760	-1.622	24.100
-1.021	-3.679	23.625	-2.008	-3.609	23.625	-0.767	-2.895	24.100
-1.023	-2.133	23.625	-2.059	-4.883	23.625	-0.784	-2.966	24.100
-1.043	-3.747	23.625	-2.061	-3.657	23.625	-0.786	-1.690	24.100
-1.053	-2.198	23.625	-2.115	-3.704	23.625	-0.800	-3.037	24.100

X	Y	Z	X	Y	Z	X	Y	Z
-0.840	-1.826	24.100	-1.620	-4.963	24.100	-0.595	-2.289	24.575
-0.852	-3.250	24.100	-1.638	-3.384	24.100	-0.610	-2.362	24.575
-0.868	-1.894	24.100	-1.680	-5.005	24.100	-0.625	-2.434	24.575
-0.870	-3.321	24.100	-1.683	-3.442	24.100	-0.634	-1.585	24.575
-0.889	-3.392	24.100	-1.729	-3.499	24.100	-0.640	-2.507	24.575
-0.896	-1.961	24.100	-1.746	-5.037	24.100	-0.656	-2.579	24.575
-0.908	-3.463	24.100	-1.778	-3.554	24.100	-0.672	-2.652	24.575
-0.924	-2.029	24.100	-1.816	-5.057	24.100	-0.688	-2.724	24.575
-0.927	-3.533	24.100	-1.828	-3.607	24.100	-0.695	-1.626	24.575
-0.947	-3.603	24.100	-1.880	-3.658	24.100	-0.704	-2.797	24.575
-0.952	-2.096	24.100	-1.889	-5.062	24.100	-0.721	-2.869	24.575
-0.968	-3.674	24.100	-1.934	-3.708	24.100	-0.727	-1.693	24.575
-0.981	-2.164	24.100	-1.961	-5.054	24.100	-0.738	-2.941	24.575
-0.989	-3.744	24.100	-1.989	-3.755	24.100	-0.754	-1.762	24.575
-1.010	-2.231	24.100	-2.032	-5.034	24.100	-0.755	-3.014	24.575
-1.011	-3.813	24.100	-2.047	-3.801	24.100	-0.773	-3.086	24.575
-1.033	-3.883	24.100	-2.099	-5.005	24.100	-0.782	-1.830	24.575
-1.039	-2.298	24.100	-2.105	-3.845	24.100	-0.790	-3.158	24.575
-1.057	-3.952	24.100	-2.164	-4.971	24.100	-0.809	-3.230	24.575
-1.069	-2.364	24.100	-2.165	-3.887	24.100	-0.810	-1.899	24.575
-1.081	-4.021	24.100	-2.225	-4.931	24.100	-0.827	-3.302	24.575
-1.099	-2.431	24.100	-2.226	-3.928	24.100	-0.838	-1.968	24.575
-1.106	-4.090	24.100	-2.285	-4.889	24.100	-0.846	-3.373	24.575
-1.130	-2.497	24.100	-2.287	-3.968	24.100	-0.865	-3.445	24.575
-1.132	-4.159	24.100	-2.342	-4.843	24.100	-0.866	-2.036	24.575
-1.159	-4.227	24.100	-2.348	-4.008	24.100	-0.885	-3.517	24.575
-1.162	-2.563	24.100	-2.397	-4.796	24.100	-0.895	-2.105	24.575
-1.187	-4.294	24.100	-2.409	-4.049	24.100	-0.905	-3.588	24.575
-1.193	-2.629	24.100	-2.451	-4.746	24.100	-0.924	-2.173	24.575
-1.216	-4.361	24.100	-2.466	-4.093	24.100	-0.926	-3.659	24.575
-1.226	-2.695	24.100	-2.501	-4.693	24.100	-0.947	-3.731	24.575
-1.246	-4.428	24.100	-2.517	-4.146	24.100	-0.953	-2.242	24.575
-1.259	-2.760	24.100	-2.517	-4.146	24.100	-0.968	-3.802	24.575
-1.279	-4.493	24.100	-2.543	-4.633	24.100	-0.983	-2.310	24.575
-1.293	-2.825	24.100	-2.556	-4.208	24.100	-0.990	-3.872	24.575
-1.312	-4.558	24.100	-2.572	-4.566	24.100	-1.012	-2.378	24.575
-1.327	-2.890	24.100	-2.580	-4.277	24.100	-1.013	-3.943	24.575
-1.348	-4.622	24.100	-2.589	-4.495	24.100	-1.037	-4.014	24.575
-1.362	-2.954	24.100	-2.592	-4.349	24.100	-1.043	-2.445	24.575
-1.386	-4.685	24.100	-2.595	-4.422	24.100	-1.061	-4.084	24.575
-1.398	-3.017	24.100	-0.485	-1.705	24.575	-1.073	-2.513	24.575
-1.426	-4.746	24.100	-0.497	-1.779	24.575	-1.085	-4.154	24.575
-1.435	-3.080	24.100	-0.505	-1.635	24.575	-1.104	-2.580	24.575
-1.469	-4.805	24.100	-0.511	-1.852	24.575	-1.111	-4.223	24.575
-1.473	-3.143	24.100	-0.524	-1.925	24.575	-1.136	-2.648	24.575
-1.513	-3.205	24.100	-0.538	-1.997	24.575	-1.138	-4.293	24.575
-1.515	-4.861	24.100	-0.552	-2.070	24.575	-1.165	-4.362	24.575

X	Y	Z	X	Y	Z	X	Y	Z
-1.224	-4.498	24.575	-2.502	-4.258	24.575	-0.895	-2.279	25.050
-1.234	-2.848	24.575	-2.502	-4.258	24.575	-0.901	-3.950	25.050
-1.255	-4.565	24.575	-2.514	-4.813	24.575	-0.923	-4.022	25.050
-1.267	-2.914	24.575	-2.544	-4.318	24.575	-0.925	-2.348	25.050
-1.288	-4.632	24.575	-2.553	-4.750	24.575	-0.946	-4.094	25.050
-1.302	-2.980	24.575	-2.572	-4.387	24.575	-0.956	-2.417	25.050
-1.323	-4.697	24.575	-2.580	-4.680	24.575	-0.970	-4.166	25.050
-1.337	-3.045	24.575	-2.588	-4.459	24.575	-0.987	-2.486	25.050
-1.360	-4.762	24.575	-2.593	-4.607	24.575	-0.995	-4.237	25.050
-1.373	-3.110	24.575	-2.595	-4.533	24.575	-1.018	-2.555	25.050
-1.399	-4.825	24.575	-0.433	-1.811	25.050	-1.021	-4.308	25.050
-1.410	-3.174	24.575	-0.443	-1.886	25.050	-1.047	-4.379	25.050
-1.440	-4.887	24.575	-0.456	-1.740	25.050	-1.049	-2.623	25.050
-1.448	-3.238	24.575	-0.457	-1.960	25.050	-1.076	-4.449	25.050
-1.484	-4.946	24.575	-0.470	-2.034	25.050	-1.081	-2.692	25.050
-1.487	-3.301	24.575	-0.484	-2.109	25.050	-1.105	-4.518	25.050
-1.527	-3.363	24.575	-0.498	-2.183	25.050	-1.113	-2.760	25.050
-1.532	-5.003	24.575	-0.512	-2.257	25.050	-1.136	-4.587	25.050
-1.569	-3.425	24.575	-0.514	-1.693	25.050	-1.146	-2.828	25.050
-1.584	-5.056	24.575	-0.526	-2.331	25.050	-1.169	-4.655	25.050
-1.612	-3.485	24.575	-0.540	-2.406	25.050	-1.179	-2.896	25.050
-1.640	-5.105	24.575	-0.554	-2.480	25.050	-1.203	-4.723	25.050
-1.656	-3.545	24.575	-0.569	-2.554	25.050	-1.213	-2.964	25.050
-1.701	-5.147	24.575	-0.584	-2.628	25.050	-1.239	-4.789	25.050
-1.702	-3.603	24.575	-0.588	-1.687	25.050	-1.247	-3.031	25.050
-1.750	-3.660	24.575	-0.599	-2.702	25.050	-1.278	-4.854	25.050
-1.767	-5.180	24.575	-0.614	-2.776	25.050	-1.282	-3.098	25.050
-1.800	-3.715	24.575	-0.629	-2.850	25.050	-1.318	-3.164	25.050
-1.838	-5.202	24.575	-0.645	-2.924	25.050	-1.319	-4.917	25.050
-1.851	-3.769	24.575	-0.652	-1.726	25.050	-1.355	-3.230	25.050
-1.904	-3.821	24.575	-0.661	-2.998	25.050	-1.363	-4.979	25.050
-1.912	-5.209	24.575	-0.677	-3.072	25.050	-1.393	-3.296	25.050
-1.959	-3.870	24.575	-0.687	-1.792	25.050	-1.409	-5.038	25.050
-1.986	-5.202	24.575	-0.693	-3.145	25.050	-1.431	-3.361	25.050
-2.016	-3.918	24.575	-0.710	-3.219	25.050	-1.459	-5.095	25.050
-2.057	-5.182	24.575	-0.716	-1.862	25.050	-1.471	-3.425	25.050
-2.075	-3.964	24.575	-0.727	-3.293	25.050	-1.512	-3.489	25.050
-2.125	-5.152	24.575	-0.745	-3.366	25.050	-1.512	-5.149	25.050
-2.135	-4.007	24.575	-0.746	-1.931	25.050	-1.554	-3.552	25.050
-2.189	-5.114	24.575	-0.762	-3.439	25.050	-1.569	-5.198	25.050
-2.196	-4.049	24.575	-0.775	-2.001	25.050	-1.597	-3.614	25.050
-2.250	-5.072	24.575	-0.781	-3.513	25.050	-1.630	-5.243	25.050
-2.259	-4.089	24.575	-0.799	-3.586	25.050	-1.641	-3.675	25.050
-2.308	-5.025	24.575	-0.805	-2.070	25.050	-1.687	-3.735	25.050
-2.322	-4.128	24.575	-0.819	-3.659	25.050	-1.695	-5.282	25.050
-2.363	-4.976	24.575	-0.835	-2.140	25.050	-1.734	-3.794	25.050
-2.386	-4.166	24.575	-0.838	-3.732	25.050	-1.763	-5.314	25.050

X	Y	Z	X	Y	Z	X	Y	Z
-1.885	-3.963	25.050	-0.571	-3.174	25.525	-1.322	-5.185	25.525
-1.910	-5.349	25.050	-0.588	-3.250	25.525	-1.337	-3.437	25.525
-1.939	-4.016	25.050	-0.604	-3.325	25.525	-1.373	-3.505	25.525
-1.985	-5.350	25.050	-0.618	-1.892	25.525	-1.377	-5.239	25.525
-1.995	-4.067	25.050	-0.621	-3.401	25.525	-1.409	-3.574	25.525
-2.052	-4.116	25.050	-0.638	-3.476	25.525	-1.437	-5.289	25.525
-2.060	-5.339	25.050	-0.652	-1.962	25.525	-1.447	-3.642	25.525
-2.112	-4.162	25.050	-0.656	-3.552	25.525	-1.485	-3.709	25.525
-2.132	-5.316	25.050	-0.674	-3.627	25.525	-1.500	-5.333	25.525
-2.173	-4.206	25.050	-0.685	-2.032	25.525	-1.524	-3.775	25.525
-2.200	-5.284	25.050	-0.692	-3.702	25.525	-1.565	-3.841	25.525
-2.237	-4.247	25.050	-0.711	-3.777	25.525	-1.568	-5.371	25.525
-2.264	-5.244	25.050	-0.717	-2.102	25.525	-1.608	-3.906	25.525
-2.302	-4.285	25.050	-0.731	-3.852	25.525	-1.638	-5.403	25.525
-2.324	-5.199	25.050	-0.750	-2.172	25.525	-1.652	-3.970	25.525
-2.369	-4.320	25.050	-0.751	-3.927	25.525	-1.697	-4.032	25.525
-2.380	-5.148	25.050	-0.771	-4.002	25.525	-1.711	-5.429	25.525
-2.432	-5.093	25.050	-0.782	-2.243	25.525	-1.745	-4.093	25.525
-2.434	-4.359	25.050	-0.793	-4.076	25.525	-1.785	-5.450	25.525
-2.481	-5.035	25.050	-0.815	-2.313	25.525	-1.795	-4.152	25.525
-2.492	-4.407	25.050	-0.815	-4.150	25.525	-1.847	-4.210	25.525
-2.525	-4.974	25.050	-0.838	-4.224	25.525	-1.861	-5.466	25.525
-2.536	-4.468	25.050	-0.847	-2.384	25.525	-1.902	-4.264	25.525
-2.561	-4.908	25.050	-0.861	-4.298	25.525	-1.938	-5.479	25.525
-2.561	-4.907	25.050	-0.879	-2.454	25.525	-1.959	-4.316	25.525
-2.567	-4.537	25.050	-0.886	-4.372	25.525	-2.015	-5.486	25.525
-2.586	-4.610	25.050	-0.911	-2.525	25.525	-2.019	-4.366	25.525
-2.586	-4.835	25.050	-0.912	-4.444	25.525	-2.082	-4.411	25.525
-2.596	-4.685	25.050	-0.939	-4.517	25.525	-2.092	-5.487	25.525
-2.596	-4.760	25.050	-0.943	-2.595	25.525	-2.147	-4.454	25.525
-0.343	-1.956	25.525	-0.968	-4.589	25.525	-2.169	-5.479	25.525
-0.353	-2.033	25.525	-0.975	-2.666	25.525	-2.213	-4.493	25.525
-0.366	-1.883	25.525	-0.998	-4.660	25.525	-2.213	-4.493	25.525
-0.366	-2.109	25.525	-1.006	-2.736	25.525	-2.245	-5.463	25.525
-0.380	-2.186	25.525	-1.030	-4.731	25.525	-2.283	-4.527	25.525
-0.394	-2.262	25.525	-1.038	-2.807	25.525	-2.318	-5.437	25.525
-0.408	-2.338	25.525	-1.063	-4.801	25.525	-2.353	-4.560	25.525
-0.421	-1.830	25.525	-1.070	-2.878	25.525	-2.386	-5.400	25.525
-0.422	-2.414	25.525	-1.099	-4.869	25.525	-2.420	-4.599	25.525
-0.436	-2.490	25.525	-1.102	-2.948	25.525	-2.446	-5.352	25.525
-0.450	-2.566	25.525	-1.135	-3.018	25.525	-2.479	-4.648	25.525
-0.465	-2.642	25.525	-1.138	-4.936	25.525	-2.498	-5.294	25.525
-0.479	-2.718	25.525	-1.167	-3.089	25.525	-2.525	-4.710	25.525
-0.494	-2.794	25.525	-1.179	-5.002	25.525	-2.539	-5.229	25.525
-0.495	-1.811	25.525	-1.200	-3.159	25.525	-2.559	-4.780	25.525
-0.509	-2.870	25.525	-1.223	-5.066	25.525	-2.572	-5.159	25.525
-0.524	-2.946	25.525	-1.234	-3.229	25.525	-2.581	-4.854	25.525

涡轮喷嘴机翼的内部芯轮廓

技术领域

本发明涉及燃气轮机的一个级的喷嘴机翼，特别地，涉及第一级涡轮喷嘴机翼内部芯轮廓。

背景技术

燃气轮机的热气通道部分的每个级必须满足很多系统要求，以便满足设计目的。特别地，涡轮部分的第一级的喷嘴段必须满足该特殊级的操作条件，也满足喷嘴机翼冷却流效率、寿命和壁厚度分配的要求。

发明内容

根据本发明的优选实施例，为燃气轮机的喷嘴机翼，最好是第一级喷嘴，提供独特的内部芯轮廓，其增强燃气轮机的性能。可以理解，喷嘴机翼的外部形状改进其与形成涡轮级的叶片的相互作用。伴随的，喷嘴机翼的内部芯轮廓形状由于结构原因也是重要的，以及对于优化具有合适壁厚的内部冷却也是重要的。喷嘴机翼内部芯轮廓由独特轨迹的点限定，其实现必要的结构和冷却要求，从而获得改进的涡轮性能。该独特轨迹的点限定内部额定芯轮廓，且由表格 I 的 X、Y 和 Z 笛卡儿坐标限定，该表格如下。在表格 I 中所示的坐标值的 1200 点是用于冷的，即，室温喷嘴机翼沿着其长度的喷嘴机翼的各个截面处。正的 X、Y 和 Z 方向分别是朝着涡轮的排放端的轴向、在尾部看的发动机旋转方向的切向和朝着外部平台径向向外。X 和 Y 坐标以距离尺寸给出，例如，英寸单位，并且在每个 Z 位置平滑地连接，以形成平滑连续的内部芯轮廓截面。Z 坐标沿着从涡轮轴线的半径以距离用英寸给出。在 X、Y 平面中的每个内部芯轮廓部分与在 Z 方向上的邻近轮廓部分平滑地连接，以使用表格 I 的坐标值形成完整的内部喷嘴机翼芯轮廓。

表格 I 提供通过内部和外部平台以及它们之间的机翼的完整内部芯机翼形状的坐标值。内部和外部平台之间的内部芯轮廓的物理形状在表格 I 中由在 22.200 和 25.050 的 Z 值限制之间限定的机翼部分给出。

可以理解,当每个喷嘴机翼在使用中加热时,内部芯轮廓会改变。这样,冷的或者室温轮廓由X、Y和Z坐标给定用于制造目的。因为制造的内部喷嘴机翼芯轮廓可能不同于由下面的表格给定的额定轮廓,在垂直于沿着额定轮廓的任何表面位置的方向上距离额定轮廓 ± 0.030 英寸的距离限定该内部喷嘴机翼芯轮廓的轮廓包络。该轮廓对于此变化是坚固的,不会削弱机翼的机械冷却和空气动力学功能。

根据本发明的优选实施例,提供有一种涡轮喷嘴段,其包括内部和外部平台,以及在平台之间延伸的机翼,该机翼具有内部额定芯轮廓,其至少一部分大致与在表格I中提出的在22.200和25.050的Z值限制之间的X、Y和Z笛卡儿坐标值一致,其中,在限制之间的Z值是从涡轮轴线到垂直于半径延伸的平面的径向距离,以及其中,X和Y值是以英寸表示的距离,当由平滑连续的弧连接时,其限定在所述Z值限制之间在沿着机翼的每个距离Z处的内部芯轮廓部分,在限制之间的Z距离处的轮廓部分相互平滑连接,以形成机翼内部芯轮廓。

根据本发明的还有的实施例,提供有一种涡轮,其包括以围绕涡轮轴线的圆周阵列设置的多个喷嘴段,每个喷嘴段包括内部和外部平台,以及在平台之间延伸的至少一个机翼,每个机翼具有内部额定芯轮廓,其至少一部分大致与在表格I中提出的在22.200和25.050的Z值限制之间的X、Y和Z笛卡儿坐标值一致,其中,在限制之间的所述Z值是从涡轮轴线到垂直于半径延伸的平面的径向距离,以及其中,X和Y值是以英寸表示的距离,当由平滑连续的弧连接时,其限定在Z值限制之间沿着机翼的每个距离Z处的内部芯轮廓部分,在限制之间的Z距离处的轮廓部分相互平滑连接,以形成机翼内部芯轮廓。

根据本发明的还有的实施例,提供有一种涡轮喷嘴段,其包括内部和外部平台,以及在平台之间延伸的机翼,该机翼具有内部额定芯轮廓,其大致与在表格I中提出的X、Y和Z笛卡儿坐标值一致,其中,Z值是从涡轮轴线到垂直于半径延伸的平面的径向距离,以及其中,X和Y值是以英寸表示的距离,当由平滑连续的弧连接时,其限定在沿着机翼的每个距离Z处的内部芯轮廓部分,在Z距离处的轮廓部分相互平滑连接,以形成机翼内部芯轮廓。

根据本发明的另一个实施例,提供有一种涡轮,其包括以围绕涡轮轴线的圆周阵列设置的多个喷嘴段,每个喷嘴段包括内部和外部平

台，以及在平台之间延伸的至少一个机翼，每个机翼具有内部额定芯轮廓，其大致与在表格 I 中提出的 X、Y 和 Z 笛卡儿坐标值一致，其中，Z 值是从涡轮轴线到垂直于半径延伸的平面的径向距离，以及其中，X 和 Y 值是以英寸表示的距离，当由平滑连续的弧连接时，其限定在沿着机翼的每个距离 Z 处的内部芯轮廓部分，Z 距离处的轮廓部分相互平滑连接，以形成机翼内部芯轮廓。

附图说明

图 1 是通过燃气轮机的多个级的热气通道的示意性表示，且示出了根据本发明的优选实施例的第一级喷嘴机翼；

图 2 是喷嘴段的透视图，其具有根据本发明的优选实施例的以实线表示的内部喷嘴机翼芯轮廓，喷嘴机翼结合内部和外部平台显示，喷嘴机翼的剩余部分由虚线显示；

图 3 是图 2 的喷嘴机翼内部芯轮廓及相关的机翼和平台的圆周透视图；

图 4 是从内部芯轮廓的外部平台上面的透视图，包括相关的机翼和平台；以及

图 5 是通常在图 3 的线 5-5 截取的喷嘴机翼的截面图。

具体实施方式

现在参考附图，特别是参考图 1，示出有通常以 10 表示的包括多个涡轮级的燃气轮机 12 的热气通道。显示了三个级。例如，第一级包括多个圆周向隔开的喷嘴 14 和叶片 16。喷嘴 14 圆周向相互隔开，且围绕转子的轴线固定。第一级叶片 16 安装在涡轮转子 17 上。还显示了涡轮 12 的第二级，包括多个圆周向隔开的喷嘴 18 和安装在转子 17 上的多个圆周向隔开的叶片 20。第三级也显示了，其包括多个圆周向隔开的喷嘴 22 和安装在转子 17 上的叶片 24。可以理解，喷嘴和叶片位于涡轮的热气通道 10 中，热气通过热气通道 10 的流动方向由箭头 26 表示。

现在参考图 2，示出有通常以 30 表示的喷嘴段，其中，一个或者多个机翼 32 分别设置在内部和外部平台 34 和 36 之间。可以理解，多个喷嘴段 30 以围绕涡轮轴线的圆周阵列设置，以形成环行流动通道，使得机翼 32 引导热气到该级的紧跟的叶片，例如，第一级叶片 16。喷嘴段 30 的叶片 32 由分别在机翼 32 内和在内部和外部平台 34 和 36 之

间内部流动空气来冷却。

喷嘴机翼的内部芯形状由附图中的实线 38 表示。在图 5 中，内部芯形状 38 采用具有分别邻近机翼的吸力和压力外表面的内壁表面 40 和 42 的机翼形式，这些外表面与内部芯轮廓 38 一起限定机翼壁厚 t 。内部芯轮廓延伸通过内部和外部平台 34 和 36。

为了限定每个喷嘴机翼的内部芯形状，包括在内部和外部平台内的，在空间中设置有一组独特轨迹的点，其满足级的要求、冷却面积、壁厚，且可以制造。限定内部喷嘴机翼芯轮廓 38 的该独特轨迹的点包括一组相对于涡轮的旋转轴线的 1200 点。在下面的表格 I 中给出的笛卡儿坐标系 X 、 Y 和 Z 值限定了喷嘴机翼沿着其长度在各个位置的内部芯轮廓 38。 X 、 Y 坐标的坐标值在表格 I 中以英寸提出，尽管在这些值适当转换时，也可以使用其它尺寸单位。在表格 I 中提出的 Z 值是从涡轮轴线到垂直于半径延伸的平面的径向距离。笛卡儿坐标系具有正交相关的 X 、 Y 和 Z 轴，且 X 轴平行于涡轮转子中心线，即，旋转轴线，正 X 坐标值为朝着尾部，即，涡轮的排放端的轴向。正 Y 坐标值为朝着尾部看在转子的旋转方向的切向上延伸，以及正 Z 坐标值为朝着外部平台径向向外。

通过在垂直于 X 、 Y 平面的 Z 方向上的选定的位置上限定 X 和 Y 坐标，可以确定沿着喷嘴机翼的长度方向在每个 Z 距离处的在附图中由实线代表性地显示的喷嘴机翼的内部芯轮廓 38。通过用平滑连续的弧连接 X 和 Y 值，在每个距离 Z 处的每个内部芯轮廓部分 38 被固定。在距离 Z 之间的各个内部位置的内部芯轮廓通过相互平滑地连接相邻的轮廓部分 38 来确定，以形成芯轮廓。这些值表示在周围非操作或者非热条件下的内部芯轮廓。

表格 I 的值产生和显示为三位小数位，以确定喷嘴机翼的内部芯轮廓。有在喷嘴机翼的实际内部轮廓中必须考虑的典型的制造公差以及涂层。因此，在表格 I 中给定的轮廓的值是额定的内部喷嘴机翼芯轮廓。因此，可以理解， $\pm$ 典型的制造公差，即， $\pm$ 值，包括任何涂层厚度，增加到在下面的表格 I 中给定的 X 和 Y 值。因此，在垂直于沿着内部芯轮廓的任何表面位置的方向上的 ± 0.030 英寸的距离限定该特定喷嘴机翼设计和涡轮的内部芯轮廓包络，即，在额定冷的或者室温下实际内部芯轮廓上测量的点和如下在相同的温度下在表格 I 中给定

那些点理想位置之间的变化范围。该内部芯轮廓对于此变化范围是结实的，不会削弱机械和冷却功能。

下面的表格 I 的值提供机翼内部芯的 X、Y 和 Z 笛卡儿值，包括通过内部和外部平台。在内部和外部平台之间的内部芯轮廓物理结构在 22.200 和 25.050 的 Z 值限制之间由表格 I 提供。这些 Z 值限制分别开始于内部平台径向向外和外部平台径向向内，且限定这些限制之间的内部芯轮廓的物理形状。

在下面的表格 I 中给定的坐标值提供通过喷嘴机翼的优选的额定内部芯轮廓包络，包括通过内部和外部平台。

X	Y	Z	X	Y	Z	X	Y	Z
-0.582	-2.413	21.250	-1.406	-3.884	21.250	-2.385	-3.350	21.250
-0.587	-2.466	21.250	-1.412	-2.397	21.250	-2.391	-4.162	21.250
-0.591	-2.361	21.250	-1.433	-3.930	21.250	-2.417	-3.392	21.250
-0.604	-2.516	21.250	-1.458	-2.423	21.250	-2.435	-4.134	21.250
-0.611	-2.312	21.250	-1.459	-3.976	21.250	-2.448	-3.435	21.250
-0.632	-2.560	21.250	-1.486	-4.021	21.250	-2.475	-4.099	21.250
-0.641	-2.269	21.250	-1.504	-2.449	21.250	-2.479	-3.478	21.250
-0.662	-2.604	21.250	-1.514	-4.067	21.250	-2.510	-4.059	21.250
-0.679	-2.233	21.250	-1.542	-4.111	21.250	-2.510	-3.520	21.250
-0.692	-2.648	21.250	-1.549	-2.476	21.250	-2.539	-4.015	21.250
-0.721	-2.692	21.250	-1.571	-4.155	21.250	-2.540	-3.564	21.250
-0.724	-2.205	21.250	-1.594	-2.505	21.250	-2.562	-3.967	21.250
-0.750	-2.736	21.250	-1.602	-4.199	21.250	-2.567	-3.610	21.250
-0.773	-2.185	21.250	-1.634	-4.241	21.250	-2.581	-3.918	21.250
-0.779	-2.781	21.250	-1.638	-2.534	21.250	-2.588	-3.658	21.250
-0.807	-2.826	21.250	-1.669	-4.280	21.250	-2.588	-3.658	21.250
-0.825	-2.174	21.250	-1.681	-2.565	21.250	-2.595	-3.867	21.250
-0.834	-2.871	21.250	-1.708	-4.316	21.250	-2.602	-3.709	21.250
-0.862	-2.916	21.250	-1.723	-2.597	21.250	-2.604	-3.815	21.250
-0.877	-2.173	21.250	-1.752	-4.345	21.250	-2.607	-3.762	21.250
-0.889	-2.961	21.250	-1.764	-2.630	21.250	-0.555	-2.141	21.725
-0.916	-3.007	21.250	-1.801	-4.364	21.250	-0.564	-2.197	21.725
-0.930	-2.181	21.250	-1.804	-2.665	21.250	-0.565	-2.086	21.725
-0.943	-3.052	21.250	-1.843	-2.701	21.250	-0.585	-2.250	21.725
-0.970	-3.098	21.250	-1.853	-4.372	21.250	-0.594	-2.037	21.725
-0.980	-2.198	21.250	-1.880	-2.738	21.250	-0.607	-2.303	21.725
-0.997	-3.143	21.250	-1.906	-4.369	21.250	-0.628	-2.355	21.725
-1.023	-3.189	21.250	-1.917	-2.776	21.250	-0.637	-2.000	21.725
-1.028	-2.219	21.250	-1.953	-2.815	21.250	-0.649	-2.408	21.725
-1.050	-3.235	21.250	-1.958	-4.359	21.250	-0.671	-2.461	21.725
-1.076	-3.281	21.250	-1.989	-2.854	21.250	-0.688	-1.975	21.725
-1.077	-2.239	21.250	-2.008	-4.343	21.250	-0.692	-2.513	21.725
-1.101	-3.327	21.250	-2.024	-2.894	21.250	-0.714	-2.566	21.725
-1.126	-2.260	21.250	-2.058	-4.324	21.250	-0.735	-2.619	21.725
-1.127	-3.374	21.250	-2.059	-2.933	21.250	-0.744	-1.966	21.725
-1.152	-3.421	21.250	-2.093	-2.974	21.250	-0.757	-2.671	21.725
-1.174	-2.281	21.250	-2.106	-4.302	21.250	-0.778	-2.724	21.725
-1.177	-3.467	21.250	-2.127	-3.015	21.250	-0.800	-2.777	21.725
-1.202	-3.514	21.250	-2.154	-4.279	21.250	-0.800	-1.972	21.725
-1.222	-2.303	21.250	-2.160	-3.056	21.250	-0.821	-2.829	21.725
-1.227	-3.560	21.250	-2.193	-3.097	21.250	-0.842	-2.882	21.725
-1.252	-3.607	21.250	-2.201	-4.255	21.250	-0.853	-1.993	21.725
-1.270	-2.326	21.250	-2.226	-3.139	21.250	-0.864	-2.935	21.725
-1.278	-3.653	21.250	-2.248	-4.231	21.250	-0.885	-2.987	21.725
-1.303	-3.699	21.250	-2.258	-3.180	21.250	-0.897	-2.028	21.725
-1.318	-2.349	21.250	-2.290	-3.223	21.250	-0.907	-3.040	21.725
-1.329	-3.746	21.250	-2.295	-4.208	21.250	-0.928	-3.093	21.725

X	Y	Z	X	Y	Z	X	Y	Z
-0.983	-2.103	21.725	-1.899	-2.955	21.725	-0.678	-2.351	22.200
-0.993	-3.251	21.725	-1.919	-4.432	21.725	-0.682	-1.761	22.200
-1.014	-3.303	21.725	-1.938	-2.996	21.725	-0.694	-2.411	22.200
-1.026	-2.141	21.725	-1.976	-4.429	21.725	-0.710	-2.470	22.200
-1.036	-3.356	21.725	-1.977	-3.038	21.725	-0.726	-2.529	22.200
-1.058	-3.408	21.725	-2.015	-3.080	21.725	-0.742	-2.588	22.200
-1.069	-2.178	21.725	-2.032	-4.421	21.725	-0.742	-1.768	22.200
-1.080	-3.461	21.725	-2.054	-3.122	21.725	-0.758	-2.647	22.200
-1.102	-3.513	21.725	-2.088	-4.410	21.725	-0.775	-2.706	22.200
-1.112	-2.215	21.725	-2.092	-3.164	21.725	-0.791	-2.765	22.200
-1.125	-3.565	21.725	-2.130	-3.206	21.725	-0.794	-1.799	22.200
-1.148	-3.618	21.725	-2.143	-4.395	21.725	-0.808	-2.824	22.200
-1.155	-2.253	21.725	-2.168	-3.248	21.725	-0.825	-2.883	22.200
-1.171	-3.670	21.725	-2.197	-4.378	21.725	-0.831	-1.848	22.200
-1.194	-3.721	21.725	-2.206	-3.291	21.725	-0.842	-2.942	22.200
-1.198	-2.290	21.725	-2.243	-3.334	21.725	-0.859	-3.000	22.200
-1.218	-3.773	21.725	-2.250	-4.358	21.725	-0.865	-1.899	22.200
-1.240	-2.327	21.725	-2.280	-3.377	21.725	-0.877	-3.059	22.200
-1.243	-3.824	21.725	-2.303	-4.337	21.725	-0.895	-3.118	22.200
-1.268	-3.875	21.725	-2.317	-3.420	21.725	-0.900	-1.949	22.200
-1.283	-2.365	21.725	-2.354	-3.464	21.725	-0.913	-3.176	22.200
-1.294	-3.926	21.725	-2.354	-4.313	21.725	-0.931	-3.235	22.200
-1.321	-3.976	21.725	-2.390	-3.507	21.725	-0.936	-1.999	22.200
-1.326	-2.403	21.725	-2.404	-4.285	21.725	-0.950	-3.293	22.200
-1.350	-4.025	21.725	-2.426	-3.551	21.725	-0.969	-3.351	22.200
-1.368	-2.440	21.725	-2.450	-4.252	21.725	-0.971	-2.049	22.200
-1.379	-4.074	21.725	-2.450	-4.252	21.725	-0.989	-3.409	22.200
-1.410	-4.121	21.725	-2.463	-3.595	21.725	-1.007	-2.099	22.200
-1.411	-2.478	21.725	-2.491	-4.213	21.725	-1.009	-3.467	22.200
-1.443	-4.168	21.725	-2.498	-3.639	21.725	-1.030	-3.524	22.200
-1.453	-2.517	21.725	-2.525	-4.167	21.725	-1.043	-2.148	22.200
-1.478	-4.212	21.725	-2.532	-3.685	21.725	-1.051	-3.582	22.200
-1.494	-2.555	21.725	-2.552	-4.117	21.725	-1.073	-3.639	22.200
-1.516	-4.255	21.725	-2.562	-3.733	21.725	-1.080	-2.197	22.200
-1.536	-2.594	21.725	-2.574	-4.064	21.725	-1.096	-3.696	22.200
-1.556	-4.295	21.725	-2.585	-3.785	21.725	-1.117	-2.246	22.200
-1.577	-2.633	21.725	-2.589	-4.010	21.725	-1.119	-3.753	22.200
-1.600	-4.331	21.725	-2.599	-3.840	21.725	-1.143	-3.809	22.200
-1.618	-2.672	21.725	-2.599	-3.954	21.725	-1.155	-2.294	22.200
-1.647	-4.363	21.725	-2.603	-3.897	21.725	-1.168	-3.865	22.200
-1.659	-2.712	21.725	-0.559	-1.877	22.200	-1.192	-2.343	22.200
-1.697	-4.390	21.725	-0.568	-1.937	22.200	-1.195	-3.920	22.200
-1.700	-2.752	21.725	-0.579	-1.820	22.200	-1.222	-3.975	22.200
-1.740	-2.792	21.725	-0.584	-1.996	22.200	-1.230	-2.391	22.200
-1.750	-4.410	21.725	-0.599	-2.055	22.200	-1.251	-4.029	22.200
-1.780	-2.832	21.725	-0.615	-2.115	22.200	-1.269	-2.438	22.200
-1.806	-4.424	21.725	-0.624	-1.779	22.200	-1.281	-4.082	22.200

X	Y	Z	X	Y	Z	X	Y	Z
-1.346	-4.186	22.200	-2.509	-4.296	22.200	-1.017	-2.034	22.675
-1.382	-4.235	22.200	-2.520	-3.783	22.200	-1.023	-3.527	22.675
-1.386	-2.580	22.200	-2.542	-4.244	22.200	-1.043	-3.590	22.675
-1.420	-4.283	22.200	-2.554	-3.833	22.200	-1.049	-2.092	22.675
-1.425	-2.627	22.200	-2.567	-4.189	22.200	-1.064	-3.652	22.675
-1.461	-4.329	22.200	-2.581	-3.888	22.200	-1.082	-2.149	22.675
-1.465	-2.673	22.200	-2.585	-4.130	22.200	-1.086	-3.714	22.675
-1.505	-4.371	22.200	-2.596	-3.948	22.200	-1.108	-3.776	22.675
-1.506	-2.719	22.200	-2.596	-4.070	22.200	-1.116	-2.205	22.675
-1.546	-2.765	22.200	-2.601	-4.009	22.200	-1.132	-3.838	22.675
-1.553	-4.410	22.200	-0.578	-1.672	22.675	-1.150	-2.262	22.675
-1.587	-2.811	22.200	-0.590	-1.609	22.675	-1.156	-3.899	22.675
-1.603	-4.444	22.200	-0.591	-1.737	22.675	-1.181	-3.960	22.675
-1.629	-2.856	22.200	-0.604	-1.801	22.675	-1.184	-2.318	22.675
-1.658	-4.473	22.200	-0.617	-1.866	22.675	-1.208	-4.020	22.675
-1.670	-2.901	22.200	-0.630	-1.930	22.675	-1.219	-2.374	22.675
-1.712	-2.945	22.200	-0.638	-1.564	22.675	-1.236	-4.080	22.675
-1.715	-4.496	22.200	-0.643	-1.995	22.675	-1.254	-2.429	22.675
-1.754	-2.990	22.200	-0.656	-2.059	22.675	-1.265	-4.139	22.675
-1.774	-4.512	22.200	-0.670	-2.124	22.675	-1.290	-2.485	22.675
-1.796	-3.034	22.200	-0.683	-2.188	22.675	-1.296	-4.197	22.675
-1.834	-4.521	22.200	-0.697	-2.252	22.675	-1.326	-2.540	22.675
-1.839	-3.078	22.200	-0.701	-1.552	22.675	-1.328	-4.254	22.675
-1.882	-3.122	22.200	-0.711	-2.317	22.675	-1.363	-2.594	22.675
-1.895	-4.525	22.200	-0.725	-2.381	22.675	-1.363	-4.310	22.675
-1.925	-3.166	22.200	-0.740	-2.445	22.675	-1.400	-2.648	22.675
-1.956	-4.524	22.200	-0.754	-2.510	22.675	-1.400	-4.364	22.675
-1.968	-3.210	22.200	-0.762	-1.575	22.675	-1.438	-2.702	22.675
-2.011	-3.253	22.200	-0.769	-2.574	22.675	-1.440	-4.417	22.675
-2.017	-4.519	22.200	-0.784	-2.638	22.675	-1.476	-2.756	22.675
-2.054	-3.297	22.200	-0.799	-2.702	22.675	-1.483	-4.466	22.675
-2.078	-4.509	22.200	-0.801	-1.627	22.675	-1.515	-2.809	22.675
-2.097	-3.340	22.200	-0.814	-2.766	22.675	-1.530	-4.513	22.675
-2.138	-4.496	22.200	-0.830	-2.830	22.675	-1.555	-2.861	22.675
-2.140	-3.384	22.200	-0.831	-1.686	22.675	-1.581	-4.554	22.675
-2.183	-3.427	22.200	-0.845	-2.894	22.675	-1.595	-2.913	22.675
-2.197	-4.479	22.200	-0.861	-1.745	22.675	-1.636	-4.590	22.675
-2.226	-3.471	22.200	-0.862	-2.958	22.675	-1.636	-2.965	22.675
-2.254	-4.459	22.200	-0.878	-3.021	22.675	-1.678	-3.016	22.675
-2.269	-3.515	22.200	-0.891	-1.803	22.675	-1.696	-4.618	22.675
-2.311	-4.436	22.200	-0.895	-3.085	22.675	-1.721	-3.066	22.675
-2.311	-3.559	22.200	-0.912	-3.149	22.675	-1.759	-4.637	22.675
-2.354	-3.603	22.200	-0.922	-1.861	22.675	-1.764	-3.116	22.675
-2.366	-4.409	22.200	-0.929	-3.212	22.675	-1.807	-3.165	22.675
-2.396	-3.647	22.200	-0.947	-3.275	22.675	-1.824	-4.647	22.675
-2.419	-4.378	22.200	-0.953	-1.919	22.675	-1.852	-3.213	22.675
-2.438	-3.691	22.200	-0.965	-3.339	22.675	-1.889	-4.648	22.675

X	Y	Z	X	Y	Z	X	Y	Z
-1.990	-3.355	22.675	-0.789	-1.523	23.150	-1.454	-2.815	23.150
-2.019	-4.629	22.675	-0.795	-2.684	23.150	-1.472	-4.561	23.150
-2.037	-3.400	22.675	-0.810	-2.752	23.150	-1.493	-2.872	23.150
-2.083	-4.612	22.675	-0.816	-1.587	23.150	-1.516	-4.615	23.150
-2.085	-3.446	22.675	-0.825	-2.819	23.150	-1.533	-2.929	23.150
-2.133	-3.490	22.675	-0.841	-2.887	23.150	-1.565	-4.664	23.150
-2.145	-4.591	22.675	-0.844	-1.651	23.150	-1.573	-2.985	23.150
-2.182	-3.535	22.675	-0.857	-2.954	23.150	-1.615	-3.041	23.150
-2.206	-4.566	22.675	-0.871	-1.714	23.150	-1.618	-4.708	23.150
-2.231	-3.579	22.675	-0.873	-3.021	23.150	-1.657	-3.095	23.150
-2.266	-4.538	22.675	-0.890	-3.089	23.150	-1.676	-4.746	23.150
-2.280	-3.622	22.675	-0.899	-1.778	23.150	-1.701	-3.149	23.150
-2.324	-4.508	22.675	-0.907	-3.156	23.150	-1.740	-4.773	23.150
-2.329	-3.666	22.675	-0.924	-3.223	23.150	-1.745	-3.203	23.150
-2.378	-3.710	22.675	-0.928	-1.841	23.150	-1.790	-3.255	23.150
-2.381	-4.475	22.675	-0.942	-3.290	23.150	-1.807	-4.788	23.150
-2.426	-3.755	22.675	-0.957	-1.904	23.150	-1.837	-3.306	23.150
-2.435	-4.438	22.675	-0.961	-3.357	23.150	-1.876	-4.791	23.150
-2.474	-3.800	22.675	-0.979	-3.423	23.150	-1.884	-3.357	23.150
-2.485	-4.394	22.675	-0.986	-1.967	23.150	-1.932	-3.407	23.150
-2.518	-3.849	22.675	-0.999	-3.490	23.150	-1.945	-4.783	23.150
-2.526	-4.343	22.675	-1.016	-2.029	23.150	-1.981	-3.456	23.150
-2.555	-3.903	22.675	-1.019	-3.556	23.150	-2.012	-4.766	23.150
-2.555	-3.903	22.675	-1.039	-3.622	23.150	-2.031	-3.503	23.150
-2.557	-4.285	22.675	-1.046	-2.092	23.150	-2.077	-4.743	23.150
-2.579	-4.223	22.675	-1.060	-3.688	23.150	-2.082	-3.551	23.150
-2.582	-3.963	22.675	-1.076	-2.154	23.150	-2.134	-3.597	23.150
-2.592	-4.159	22.675	-1.082	-3.754	23.150	-2.141	-4.715	23.150
-2.595	-4.028	22.675	-1.105	-3.819	23.150	-2.186	-3.643	23.150
-2.598	-4.093	22.675	-1.108	-2.216	23.150	-2.202	-4.683	23.150
-0.583	-1.527	23.150	-1.128	-3.884	23.150	-2.238	-3.687	23.150
-0.587	-1.596	23.150	-1.139	-2.277	23.150	-2.262	-4.648	23.150
-0.598	-1.664	23.150	-1.153	-3.949	23.150	-2.291	-3.732	23.150
-0.610	-1.732	23.150	-1.172	-2.338	23.150	-2.321	-4.611	23.150
-0.621	-1.470	23.150	-1.178	-4.014	23.150	-2.345	-3.776	23.150
-0.622	-1.800	23.150	-1.204	-4.078	23.150	-2.378	-4.573	23.150
-0.634	-1.869	23.150	-1.205	-2.399	23.150	-2.398	-3.821	23.150
-0.646	-1.937	23.150	-1.232	-4.141	23.150	-2.434	-4.532	23.150
-0.659	-2.005	23.150	-1.238	-2.460	23.150	-2.451	-3.866	23.150
-0.672	-2.073	23.150	-1.261	-4.204	23.150	-2.485	-4.485	23.150
-0.684	-2.141	23.150	-1.272	-2.520	23.150	-2.500	-3.914	23.150
-0.685	-1.448	23.150	-1.291	-4.267	23.150	-2.529	-4.431	23.150
-0.697	-2.209	23.150	-1.307	-2.580	23.150	-2.543	-3.969	23.150
-0.711	-2.277	23.150	-1.323	-4.328	23.150	-2.543	-3.969	23.150
-0.724	-2.345	23.150	-1.343	-2.639	23.150	-2.560	-4.370	23.150
-0.738	-2.413	23.150	-1.356	-4.389	23.150	-2.573	-4.031	23.150
-0.750	-1.468	23.150	-1.379	-2.698	23.150	-2.581	-4.304	23.150

X	Y	Z	X	Y	Z	X	Y	Z
-0.566	-1.586	23.625	-1.110	-3.950	23.625	-2.226	-3.794	23.625
-0.567	-1.515	23.625	-1.115	-2.326	23.625	-2.246	-4.780	23.625
-0.578	-1.656	23.625	-1.135	-4.017	23.625	-2.282	-3.837	23.625
-0.590	-1.727	23.625	-1.147	-2.390	23.625	-2.305	-4.739	23.625
-0.602	-1.797	23.625	-1.160	-4.084	23.625	-2.339	-3.881	23.625
-0.610	-1.460	23.625	-1.179	-2.454	23.625	-2.362	-4.696	23.625
-0.614	-1.868	23.625	-1.186	-4.151	23.625	-2.396	-3.924	23.625
-0.626	-1.938	23.625	-1.212	-2.517	23.625	-2.418	-4.652	23.625
-0.639	-2.008	23.625	-1.213	-4.217	23.625	-2.452	-3.968	23.625
-0.652	-2.079	23.625	-1.242	-4.282	23.625	-2.471	-4.604	23.625
-0.665	-2.149	23.625	-1.246	-2.580	23.625	-2.504	-4.017	23.625
-0.678	-2.219	23.625	-1.272	-4.347	23.625	-2.519	-4.551	23.625
-0.679	-1.445	23.625	-1.280	-2.643	23.625	-2.519	-4.551	23.625
-0.691	-2.289	23.625	-1.304	-4.411	23.625	-2.546	-4.074	23.625
-0.705	-2.359	23.625	-1.315	-2.705	23.625	-2.555	-4.489	23.625
-0.718	-2.430	23.625	-1.337	-4.474	23.625	-2.575	-4.140	23.625
-0.732	-2.500	23.625	-1.351	-2.767	23.625	-2.579	-4.422	23.625
-0.741	-1.477	23.625	-1.372	-4.536	23.625	-2.590	-4.209	23.625
-0.747	-2.570	23.625	-1.388	-2.828	23.625	-2.591	-4.352	23.625
-0.761	-2.640	23.625	-1.410	-4.597	23.625	-2.595	-4.281	23.625
-0.773	-1.540	23.625	-1.426	-2.889	23.625	-0.522	-1.602	24.100
-0.776	-2.709	23.625	-1.451	-4.656	23.625	-0.531	-1.674	24.100
-0.791	-2.779	23.625	-1.464	-2.949	23.625	-0.544	-1.746	24.100
-0.799	-1.607	23.625	-1.494	-4.712	23.625	-0.548	-1.535	24.100
-0.807	-2.849	23.625	-1.503	-3.009	23.625	-0.556	-1.818	24.100
-0.822	-2.919	23.625	-1.541	-4.766	23.625	-0.569	-1.890	24.100
-0.826	-1.673	23.625	-1.543	-3.068	23.625	-0.581	-1.962	24.100
-0.838	-2.988	23.625	-1.585	-3.126	23.625	-0.594	-2.034	24.100
-0.853	-1.739	23.625	-1.593	-4.815	23.625	-0.608	-2.106	24.100
-0.855	-3.058	23.625	-1.627	-3.184	23.625	-0.609	-1.497	24.100
-0.872	-3.127	23.625	-1.650	-4.858	23.625	-0.621	-2.178	24.100
-0.880	-1.805	23.625	-1.670	-3.241	23.625	-0.634	-2.250	24.100
-0.889	-3.197	23.625	-1.712	-4.893	23.625	-0.648	-2.322	24.100
-0.906	-3.266	23.625	-1.715	-3.296	23.625	-0.662	-2.394	24.100
-0.908	-1.871	23.625	-1.761	-3.351	23.625	-0.676	-2.465	24.100
-0.924	-3.335	23.625	-1.780	-4.916	23.625	-0.681	-1.504	24.100
-0.936	-1.937	23.625	-1.808	-3.405	23.625	-0.691	-2.537	24.100
-0.943	-3.404	23.625	-1.850	-4.926	23.625	-0.706	-2.609	24.100
-0.962	-3.473	23.625	-1.856	-3.458	23.625	-0.721	-2.680	24.100
-0.964	-2.002	23.625	-1.905	-3.509	23.625	-0.733	-1.554	24.100
-0.981	-3.542	23.625	-1.922	-4.922	23.625	-0.736	-2.752	24.100
-0.993	-2.068	23.625	-1.956	-3.560	23.625	-0.752	-2.823	24.100
-1.001	-3.610	23.625	-1.991	-4.907	23.625	-0.760	-1.622	24.100
-1.021	-3.679	23.625	-2.008	-3.609	23.625	-0.767	-2.895	24.100
-1.023	-2.133	23.625	-2.059	-4.883	23.625	-0.784	-2.966	24.100
-1.043	-3.747	23.625	-2.061	-3.657	23.625	-0.786	-1.690	24.100
-1.053	-2.198	23.625	-2.115	-3.704	23.625	-0.800	-3.037	24.100

X	Y	Z	X	Y	Z	X	Y	Z
-0.840	-1.826	24.100	-1.620	-4.963	24.100	-0.595	-2.289	24.575
-0.852	-3.250	24.100	-1.638	-3.384	24.100	-0.610	-2.362	24.575
-0.868	-1.894	24.100	-1.680	-5.005	24.100	-0.625	-2.434	24.575
-0.870	-3.321	24.100	-1.683	-3.442	24.100	-0.634	-1.585	24.575
-0.889	-3.392	24.100	-1.729	-3.499	24.100	-0.640	-2.507	24.575
-0.896	-1.961	24.100	-1.746	-5.037	24.100	-0.656	-2.579	24.575
-0.908	-3.463	24.100	-1.778	-3.554	24.100	-0.672	-2.652	24.575
-0.924	-2.029	24.100	-1.816	-5.057	24.100	-0.688	-2.724	24.575
-0.927	-3.533	24.100	-1.828	-3.607	24.100	-0.695	-1.626	24.575
-0.947	-3.603	24.100	-1.880	-3.658	24.100	-0.704	-2.797	24.575
-0.952	-2.096	24.100	-1.889	-5.062	24.100	-0.721	-2.869	24.575
-0.968	-3.674	24.100	-1.934	-3.708	24.100	-0.727	-1.693	24.575
-0.981	-2.164	24.100	-1.961	-5.054	24.100	-0.738	-2.941	24.575
-0.989	-3.744	24.100	-1.989	-3.755	24.100	-0.754	-1.762	24.575
-1.010	-2.231	24.100	-2.032	-5.034	24.100	-0.755	-3.014	24.575
-1.011	-3.813	24.100	-2.047	-3.801	24.100	-0.773	-3.086	24.575
-1.033	-3.883	24.100	-2.099	-5.005	24.100	-0.782	-1.830	24.575
-1.039	-2.298	24.100	-2.105	-3.845	24.100	-0.790	-3.158	24.575
-1.057	-3.952	24.100	-2.164	-4.971	24.100	-0.809	-3.230	24.575
-1.069	-2.364	24.100	-2.165	-3.887	24.100	-0.810	-1.899	24.575
-1.081	-4.021	24.100	-2.225	-4.931	24.100	-0.827	-3.302	24.575
-1.099	-2.431	24.100	-2.226	-3.928	24.100	-0.838	-1.968	24.575
-1.106	-4.090	24.100	-2.285	-4.889	24.100	-0.846	-3.373	24.575
-1.130	-2.497	24.100	-2.287	-3.968	24.100	-0.865	-3.445	24.575
-1.132	-4.159	24.100	-2.342	-4.843	24.100	-0.866	-2.036	24.575
-1.159	-4.227	24.100	-2.348	-4.008	24.100	-0.885	-3.517	24.575
-1.162	-2.563	24.100	-2.397	-4.796	24.100	-0.895	-2.105	24.575
-1.187	-4.294	24.100	-2.409	-4.049	24.100	-0.905	-3.588	24.575
-1.193	-2.629	24.100	-2.451	-4.746	24.100	-0.924	-2.173	24.575
-1.216	-4.361	24.100	-2.466	-4.093	24.100	-0.926	-3.659	24.575
-1.226	-2.695	24.100	-2.501	-4.693	24.100	-0.947	-3.731	24.575
-1.246	-4.428	24.100	-2.517	-4.146	24.100	-0.953	-2.242	24.575
-1.259	-2.760	24.100	-2.517	-4.146	24.100	-0.968	-3.802	24.575
-1.279	-4.493	24.100	-2.543	-4.633	24.100	-0.983	-2.310	24.575
-1.293	-2.825	24.100	-2.556	-4.208	24.100	-0.990	-3.872	24.575
-1.312	-4.558	24.100	-2.572	-4.566	24.100	-1.012	-2.378	24.575
-1.327	-2.890	24.100	-2.580	-4.277	24.100	-1.013	-3.943	24.575
-1.348	-4.622	24.100	-2.589	-4.495	24.100	-1.037	-4.014	24.575
-1.362	-2.954	24.100	-2.592	-4.349	24.100	-1.043	-2.445	24.575
-1.386	-4.685	24.100	-2.595	-4.422	24.100	-1.061	-4.084	24.575
-1.398	-3.017	24.100	-0.485	-1.705	24.575	-1.073	-2.513	24.575
-1.426	-4.746	24.100	-0.497	-1.779	24.575	-1.085	-4.154	24.575
-1.435	-3.080	24.100	-0.505	-1.635	24.575	-1.104	-2.580	24.575
-1.469	-4.805	24.100	-0.511	-1.852	24.575	-1.111	-4.223	24.575
-1.473	-3.143	24.100	-0.524	-1.925	24.575	-1.136	-2.648	24.575
-1.513	-3.205	24.100	-0.538	-1.997	24.575	-1.138	-4.293	24.575
-1.515	-4.861	24.100	-0.552	-2.070	24.575	-1.165	-4.362	24.575

X	Y	Z	X	Y	Z	X	Y	Z
-1.224	-4.498	24.575	-2.502	-4.258	24.575	-0.895	-2.279	25.050
-1.234	-2.848	24.575	-2.502	-4.258	24.575	-0.901	-3.950	25.050
-1.255	-4.565	24.575	-2.514	-4.813	24.575	-0.923	-4.022	25.050
-1.267	-2.914	24.575	-2.544	-4.318	24.575	-0.925	-2.348	25.050
-1.288	-4.632	24.575	-2.553	-4.750	24.575	-0.946	-4.094	25.050
-1.302	-2.980	24.575	-2.572	-4.387	24.575	-0.956	-2.417	25.050
-1.323	-4.697	24.575	-2.580	-4.680	24.575	-0.970	-4.166	25.050
-1.337	-3.045	24.575	-2.588	-4.459	24.575	-0.987	-2.486	25.050
-1.360	-4.762	24.575	-2.593	-4.607	24.575	-0.995	-4.237	25.050
-1.373	-3.110	24.575	-2.595	-4.533	24.575	-1.018	-2.555	25.050
-1.399	-4.825	24.575	-0.433	-1.811	25.050	-1.021	-4.308	25.050
-1.410	-3.174	24.575	-0.443	-1.886	25.050	-1.047	-4.379	25.050
-1.440	-4.887	24.575	-0.456	-1.740	25.050	-1.049	-2.623	25.050
-1.448	-3.238	24.575	-0.457	-1.960	25.050	-1.076	-4.449	25.050
-1.484	-4.946	24.575	-0.470	-2.034	25.050	-1.081	-2.692	25.050
-1.487	-3.301	24.575	-0.484	-2.109	25.050	-1.105	-4.518	25.050
-1.527	-3.363	24.575	-0.498	-2.183	25.050	-1.113	-2.760	25.050
-1.532	-5.003	24.575	-0.512	-2.257	25.050	-1.136	-4.587	25.050
-1.569	-3.425	24.575	-0.514	-1.693	25.050	-1.146	-2.828	25.050
-1.584	-5.056	24.575	-0.526	-2.331	25.050	-1.169	-4.655	25.050
-1.612	-3.485	24.575	-0.540	-2.406	25.050	-1.179	-2.896	25.050
-1.640	-5.105	24.575	-0.554	-2.480	25.050	-1.203	-4.723	25.050
-1.656	-3.545	24.575	-0.569	-2.554	25.050	-1.213	-2.964	25.050
-1.701	-5.147	24.575	-0.584	-2.628	25.050	-1.239	-4.789	25.050
-1.702	-3.603	24.575	-0.588	-1.687	25.050	-1.247	-3.031	25.050
-1.750	-3.660	24.575	-0.599	-2.702	25.050	-1.278	-4.854	25.050
-1.767	-5.180	24.575	-0.614	-2.776	25.050	-1.282	-3.098	25.050
-1.800	-3.715	24.575	-0.629	-2.850	25.050	-1.318	-3.164	25.050
-1.838	-5.202	24.575	-0.645	-2.924	25.050	-1.319	-4.917	25.050
-1.851	-3.769	24.575	-0.652	-1.726	25.050	-1.355	-3.230	25.050
-1.904	-3.821	24.575	-0.661	-2.998	25.050	-1.363	-4.979	25.050
-1.912	-5.209	24.575	-0.677	-3.072	25.050	-1.393	-3.296	25.050
-1.959	-3.870	24.575	-0.687	-1.792	25.050	-1.409	-5.038	25.050
-1.986	-5.202	24.575	-0.693	-3.145	25.050	-1.431	-3.361	25.050
-2.016	-3.918	24.575	-0.710	-3.219	25.050	-1.459	-5.095	25.050
-2.057	-5.182	24.575	-0.716	-1.862	25.050	-1.471	-3.425	25.050
-2.075	-3.964	24.575	-0.727	-3.293	25.050	-1.512	-3.489	25.050
-2.125	-5.152	24.575	-0.745	-3.366	25.050	-1.512	-5.149	25.050
-2.135	-4.007	24.575	-0.746	-1.931	25.050	-1.554	-3.552	25.050
-2.189	-5.114	24.575	-0.762	-3.439	25.050	-1.569	-5.198	25.050
-2.196	-4.049	24.575	-0.775	-2.001	25.050	-1.597	-3.614	25.050
-2.250	-5.072	24.575	-0.781	-3.513	25.050	-1.630	-5.243	25.050
-2.259	-4.089	24.575	-0.799	-3.586	25.050	-1.641	-3.675	25.050
-2.308	-5.025	24.575	-0.805	-2.070	25.050	-1.687	-3.735	25.050
-2.322	-4.128	24.575	-0.819	-3.659	25.050	-1.695	-5.282	25.050
-2.363	-4.976	24.575	-0.835	-2.140	25.050	-1.734	-3.794	25.050
-2.386	-4.166	24.575	-0.838	-3.732	25.050	-1.763	-5.314	25.050

X	Y	Z	X	Y	Z	X	Y	Z
-1.885	-3.963	25.050	-0.571	-3.174	25.525	-1.322	-5.185	25.525
-1.910	-5.349	25.050	-0.588	-3.250	25.525	-1.337	-3.437	25.525
-1.939	-4.016	25.050	-0.604	-3.325	25.525	-1.373	-3.505	25.525
-1.985	-5.350	25.050	-0.618	-1.892	25.525	-1.377	-5.239	25.525
-1.995	-4.067	25.050	-0.621	-3.401	25.525	-1.409	-3.574	25.525
-2.052	-4.116	25.050	-0.638	-3.476	25.525	-1.437	-5.289	25.525
-2.060	-5.339	25.050	-0.652	-1.962	25.525	-1.447	-3.642	25.525
-2.112	-4.162	25.050	-0.656	-3.552	25.525	-1.485	-3.709	25.525
-2.132	-5.316	25.050	-0.674	-3.627	25.525	-1.500	-5.333	25.525
-2.173	-4.206	25.050	-0.685	-2.032	25.525	-1.524	-3.775	25.525
-2.200	-5.284	25.050	-0.692	-3.702	25.525	-1.565	-3.841	25.525
-2.237	-4.247	25.050	-0.711	-3.777	25.525	-1.568	-5.371	25.525
-2.264	-5.244	25.050	-0.717	-2.102	25.525	-1.608	-3.906	25.525
-2.302	-4.285	25.050	-0.731	-3.852	25.525	-1.638	-5.403	25.525
-2.324	-5.199	25.050	-0.750	-2.172	25.525	-1.652	-3.970	25.525
-2.369	-4.320	25.050	-0.751	-3.927	25.525	-1.697	-4.032	25.525
-2.380	-5.148	25.050	-0.771	-4.002	25.525	-1.711	-5.429	25.525
-2.432	-5.093	25.050	-0.782	-2.243	25.525	-1.745	-4.093	25.525
-2.434	-4.359	25.050	-0.793	-4.076	25.525	-1.785	-5.450	25.525
-2.481	-5.035	25.050	-0.815	-2.313	25.525	-1.795	-4.152	25.525
-2.492	-4.407	25.050	-0.815	-4.150	25.525	-1.847	-4.210	25.525
-2.525	-4.974	25.050	-0.838	-4.224	25.525	-1.861	-5.466	25.525
-2.536	-4.468	25.050	-0.847	-2.384	25.525	-1.902	-4.264	25.525
-2.561	-4.908	25.050	-0.861	-4.298	25.525	-1.938	-5.479	25.525
-2.561	-4.907	25.050	-0.879	-2.454	25.525	-1.959	-4.316	25.525
-2.567	-4.537	25.050	-0.886	-4.372	25.525	-2.015	-5.486	25.525
-2.586	-4.610	25.050	-0.911	-2.525	25.525	-2.019	-4.366	25.525
-2.586	-4.835	25.050	-0.912	-4.444	25.525	-2.082	-4.411	25.525
-2.596	-4.685	25.050	-0.939	-4.517	25.525	-2.092	-5.487	25.525
-2.596	-4.760	25.050	-0.943	-2.595	25.525	-2.147	-4.454	25.525
-0.343	-1.956	25.525	-0.968	-4.589	25.525	-2.169	-5.479	25.525
-0.353	-2.033	25.525	-0.975	-2.666	25.525	-2.213	-4.493	25.525
-0.366	-1.883	25.525	-0.998	-4.660	25.525	-2.213	-4.493	25.525
-0.366	-2.109	25.525	-1.006	-2.736	25.525	-2.245	-5.463	25.525
-0.380	-2.186	25.525	-1.030	-4.731	25.525	-2.283	-4.527	25.525
-0.394	-2.262	25.525	-1.038	-2.807	25.525	-2.318	-5.437	25.525
-0.408	-2.338	25.525	-1.063	-4.801	25.525	-2.353	-4.560	25.525
-0.421	-1.830	25.525	-1.070	-2.878	25.525	-2.386	-5.400	25.525
-0.422	-2.414	25.525	-1.099	-4.869	25.525	-2.420	-4.599	25.525
-0.436	-2.490	25.525	-1.102	-2.948	25.525	-2.446	-5.352	25.525
-0.450	-2.566	25.525	-1.135	-3.018	25.525	-2.479	-4.648	25.525
-0.465	-2.642	25.525	-1.138	-4.936	25.525	-2.498	-5.294	25.525
-0.479	-2.718	25.525	-1.167	-3.089	25.525	-2.525	-4.710	25.525
-0.494	-2.794	25.525	-1.179	-5.002	25.525	-2.539	-5.229	25.525
-0.495	-1.811	25.525	-1.200	-3.159	25.525	-2.559	-4.780	25.525
-0.509	-2.870	25.525	-1.223	-5.066	25.525	-2.572	-5.159	25.525
-0.524	-2.946	25.525	-1.234	-3.229	25.525	-2.581	-4.854	25.525

还可以理解，在上面表格中披露的喷嘴机翼的内部芯轮廓可以几何上按比例增加或者减小，以用于其它类似的涡轮设计。因此，在表格 I 中提出的坐标值可按比例增大或者减小，使得喷嘴机翼的内部轮廓形状保持不变。表格 I 的坐标的按比例变体通过表格 I 的 X、Y 和 Z 坐标值乘以或者除以常数来表示。

虽然结合目前认为是最实际和优选的实施例描述了本发明，但是可以理解，本发明不限于披露的实施例，相反，其意在覆盖包括在后附的权利要求书的精神和范围内的各种修改和等价装置。

部件列表

- 30 喷嘴段
- 32 机翼
- 34 外部平台
- 36 内部平台
- 38 芯轮廓

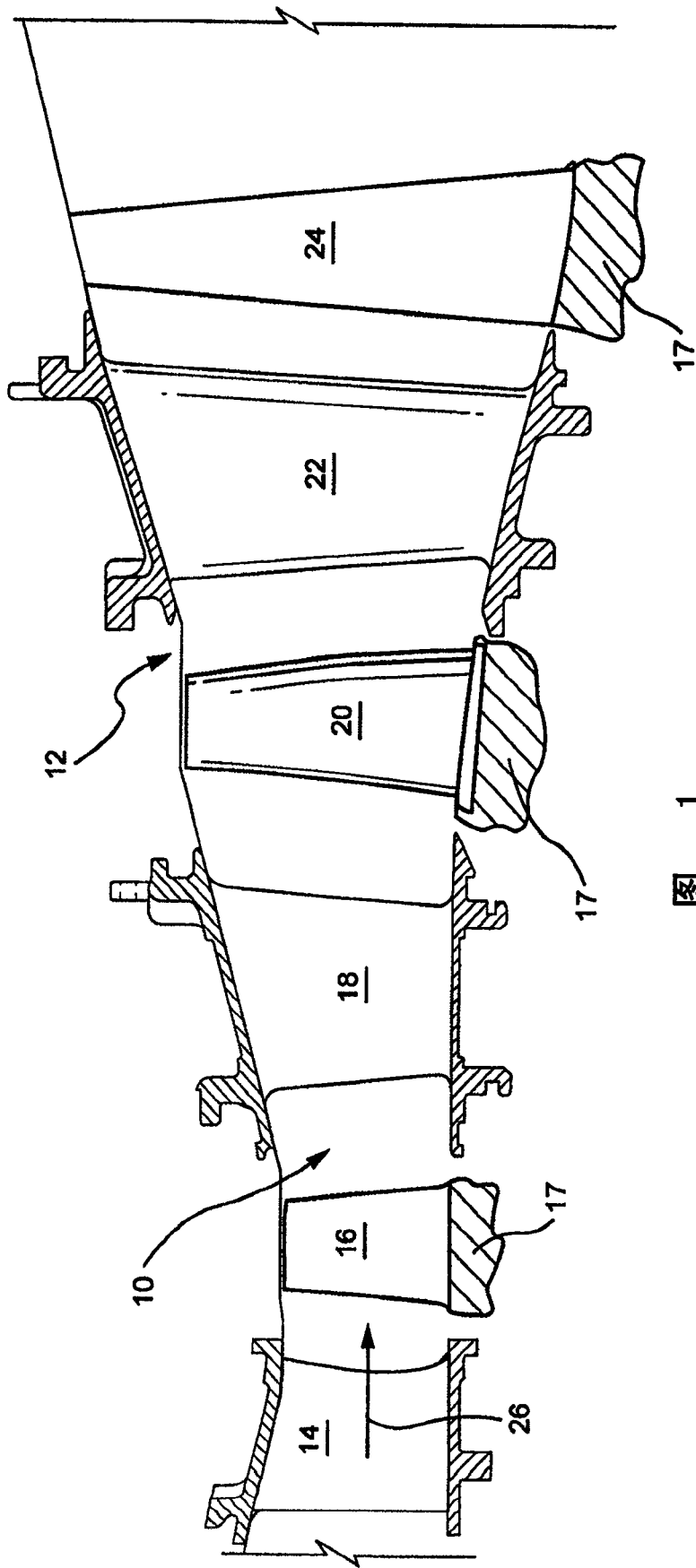


图 1

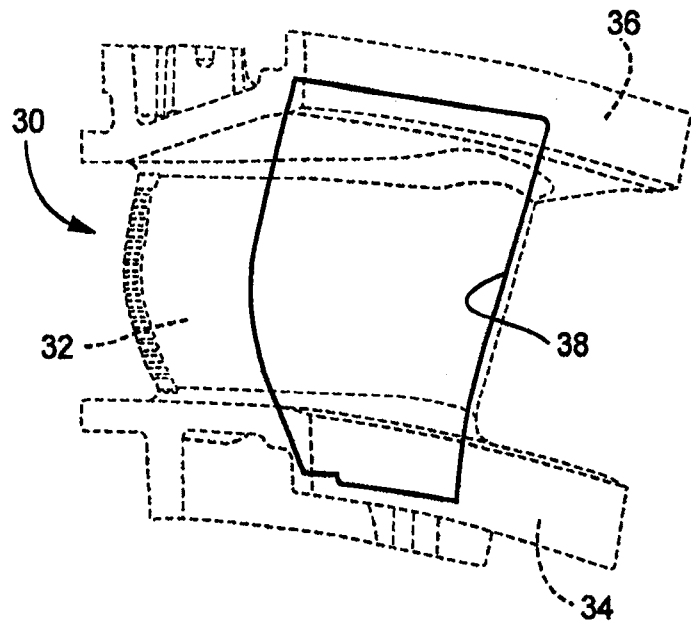


图 2

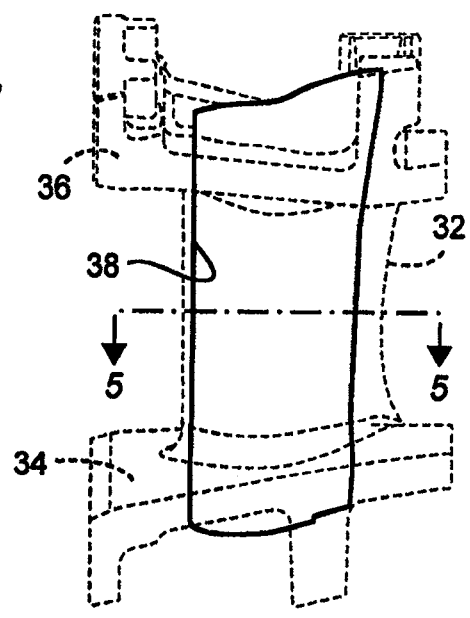


图 3

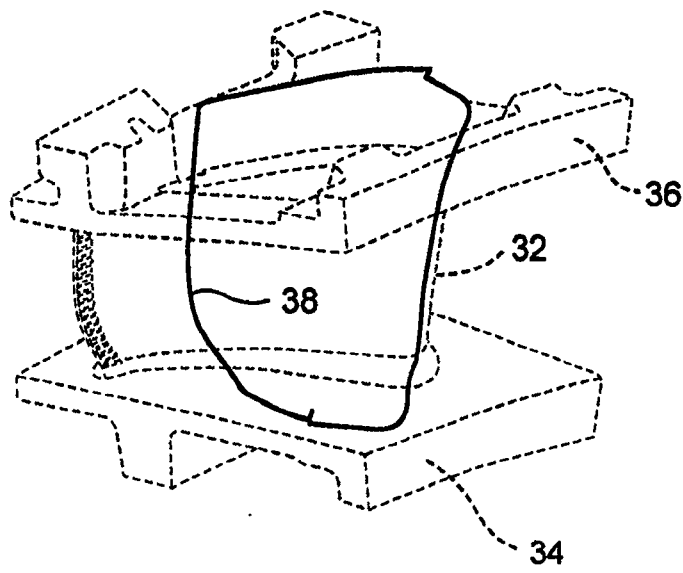


图 4

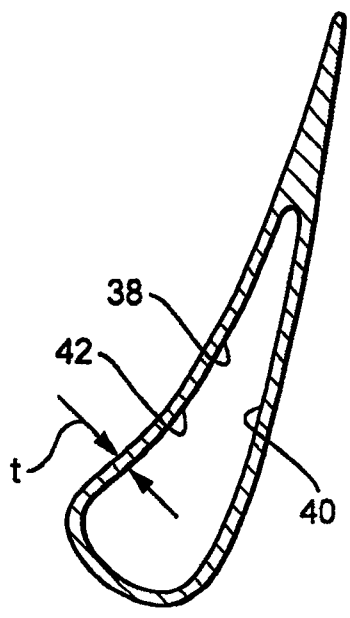


图 5