The Study of the Auto Disk Brake Air Test

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Abstract: In the paper weakness of air leakage system in our company is discussed firstly. Secondly the improved scheme of air leakage system including auto-control is designed. Then, the tooling with role of location and recovery is developed. At last the application of design optimization is processed. The result reveals that the system of air leak-age detection is very valuable and important to manufacture.

Key words: auto; disk brake; air leakage test; piston

1 Introduction

The hydraulic brake is an important part of vehicle. Because brake stability is related to safety of the person and property , all brake parts processing and assembly need very strict requirements. The company early introduced the German instruments , in the assembly lines of two processes of high and low pressure air tightness testing. The detection quality is acceptable , but it can't meet the customer delivery and quantity requirements with longer detection cycle , less efficient.

Under the premise of no additional personnel and equipment investment, the company switched to use 100 kg of high-pressure inert gas to fill the confined space of the caliper body, piston and piston rings, placed in containers filled with alcohol. The operator judges brake leaks by visual of whether thereare bubbles. That is a simple and intuitive operation with high efficiency. The principle is that the brake tooling is placed in containers with alcohol after positioning. Moreover, the high-pressure nitrogen gas is injected into the hole of the brake caliper continuously. Highpressure gas drives piston to reach the maximum stroke, and the bubbles can be visualized. Then turn off the gas source , the remnants of high-pressure gas through the valve-type tooling discharges randomly at the end of the process. Such leakage detection programs and tools have the following disadvantages. Firstly , labor intensity is not the trend of industrial development and automation and is not encouraged by the government. Secondly , valve type tooling exclusion of high-pressure gas is unsafe and does not comply with the spirit of the national nature of security. Thirdly , leakage detection state is the stationary state. When the piston strokes we can't guarantee the tightness of the other trip; the detection quality is not reliable. The working principle is shown in Figure 1.

For the above defects , the company integrated nine experts from chassis innovation expert workstations , technical department , production department , equipment department to be responsible for program design and tooling manufacturing. The first goal is reducing labor intensity. The second aim is processing dynamic detection.

2 Designs

There are control units, execution unit, targeted at high-pressure gas source, instructions in the system. Figure 2 shows the schematic diagram of the design.

Received 12 August 2012

lowing^[2]:

1) The excavator will be decomposed into individual components and classified , then use Pro/E software to draw the 3D solid model of its various parts.

2) After the model establishment , determine the design parameters of each class of parts. It can modify every parameter's symbol and set the function relation among the parameters through a "tool-relation" toolbar. Proving finish the added parameters in the "toolparameter" toolbar.

3) Open the Family Table dialog box though the "tool-family table" toolbar. First increase the table to control the variables and select the parameters in the Parameters Dialog Box. Second add a table row to create the solid model to generate the various models of the excavator.

4) Last , check the derived part models using the "Verify" button in the Family Table dialog box.

3 Secondary development

Pro/Engineer software has its secondary development toolkit Pro/toolkit application modules. The paper uses Vs C + +2005 programming language to finish the user visual interface design for the model establishment.

3. 1 Add menus and buttons in the menu bar of **Pro/E** 4.0

3. 1. 1 Write resource code^[3]

Open the Vs C + +2005 programming software , create a new MFC DLL project file (Excavatordesign) , and complete to setting included files , library files and project properties. In the excavator design , cpp resource code , add some program segment. The portion of the resource program reads as follows:

//Function declaration

int ExcavatorMenuActFn () ; //Excavator design action function $% \mathcal{L}^{(1)}(\mathcal{L})$

//User initialization function

extern "C" int user_initialize()

{

//Setting up the menu information file name

ProStringToWstring (MsgFile, "ExcavatorMessage. txt");

//Adding a menu bar

status = ProMenubarMenuAdd("Excavator Design" , "Excavator Design" , "Utilities" , PRO_B_TRUE , MsgFile);

.....

status = ProCmdActionAdd("PushButtonAct8" (uiCmdCmdActFn) ExcavatorMenuActFn , uiCmdPrioDefault , AccessDefault , PRO_ B_ TRUE , PRO_ B_ TRUE & PushButton _ cmd_ id) ;

status = ProMenubarmenuPushbuttonAdd ("Model" , "BucketCylinder" , "BucketCylinder" , "BucketCylinder" , "Rocker" , PRO_ B_ TRUE , PushButton_ cmd_id ,MsgFile) ;

return (0);

}

3.1.2 Compile and run

Resource programs being compiled and run can generate a DLL file after finishing its preparation. Click the "generate solution" button to compile to the purpose file and generate project files.

1) The preparation of the information resource file

The resource file information (.txt format) is saved in a text file. It contains chinese_cn and usascii. Its content must be consistent with resource programs', otherwise there will be an error message.

2) Write register file^[4]

First , write _ protk. dat register file manually. Second , open it in the "auxiliary applications" menu of Pro/Engineer. After its successful run , some menu bars will be added in the Pro/E 4.0 menu.

3.2 Create a MFC dialog

In modeling the GUI developer we should pay the most attention to the friendliness , as well as the mod-

el call's arbitrariness and the convenience of the modified^[5]. Figure 1 shows two aspects in the menu interface interactivity, menu and dialog.

Creating a dialog box in the general process that consists of 7 steps:

1) Use the application wizard App Wizard to create a Pro/toolkit application framework , then add two functions , user_initialize() and user_terninate().

2) Write down dialog resource.

3) Set some dialog layout properties , such as resize the dialog box , drop some required controls to a dialog from the controls toolbar , add the control data members and so on.

4) Use the class wizard to establish a dialog class. It will generate a header file and a corresponding file which are defined by a CDialog derived class.

5) Define the message processing function.

6) Create and display a dialog box, then design in the menu action.

7) Last, generate a Pro/toolkit application program^[5].

There are 4 MFC dialog box: modal dialog box, modeless dialog box, property pages modal dialog and property pages modeless dialog. This paper uses a modeless dialog box. In the Pro/Engineer environment, register, compile, run, then there will generate the needed 3D model diagram^[3]. Take the boom of graphic design as example, create a Modalless dialog box and run. After clicking the "boom" button, there will appear a parameter dialog box of boom design. Enter the appropriate data (Figure 1); it will generate a movable arm model diagram (Figure 2)^[1].



Figure 1 The parameters dialog box of boom design



Figure 2 Arm model diagram

4 Model

According to the above described method, develop an excavator working device modeling module, and complete the establishment of the excavator working device 3D solid model through the friendly menu interface. Using the top-down design idea, assemble into the needed solid model by themselves with all single model parts , as shown in Figure $3^{[1]}$.



Figure 3 The application of the excavator working device modeling module

5 Conclusions

In this paper , we use Pro/E 4.0 software to make the parametric design , Pro/toolkit toolkit to make secondary development , and regard Vs C + +2005 as a language development platform. In the end , this paper developed an excavator working device rapid modeling module. Its interface is very friendly and convenient. The design method used in this paper will save a lot of time for the design of the excavator working device. And it is universal in all of the mechanical product design. With the software upgrading ceaselessly , it will be more important for the high version software development^[6]. Of course , it also reflects its social value. It's well believed that the application of secondary development will be used more and more widely , and the role will be greater.

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Brief Biographies

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