The Rear Oil Seal Manual Press is based on the Crankshaft of a Large Bore Engine

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Abstract: To address challenges in the assembly of rear cranshaft oil seals for large-cylinder engines-Including low positioning accuracy, uneven pressing force, and seal damage-The manual pressing device is designed. This mechanism features a mechanical core with a positioning system for Precise alignment between the crankshaft and oil seal, a pressure transmission system ensuring force equilibrium during assembly, and a guiding structure to prevent track deviation. With its user-friendly operation and cost-effectiveness, this solution is ideal for small-to-medium batch production or on-site maintenance, offering a new approach for efficient and reliable assembly of rear crankshaft oil seals in large-cylinder engines.

Keywords: Rear Cranshaft Oil Seals; Guiding Structure; Mechanism; Small-To-Medium Batch Production

1. System Structure

The positioning mechanism is in direct contact with the crankshaft and bolt the unit to the end of the crankshaft for positioning (see Figure 1 and 2), ensuring the correct position of the subsequent press-fit oil seal, and the chamfer of the unit facilitates the installation of the rear oil seal[1-3].

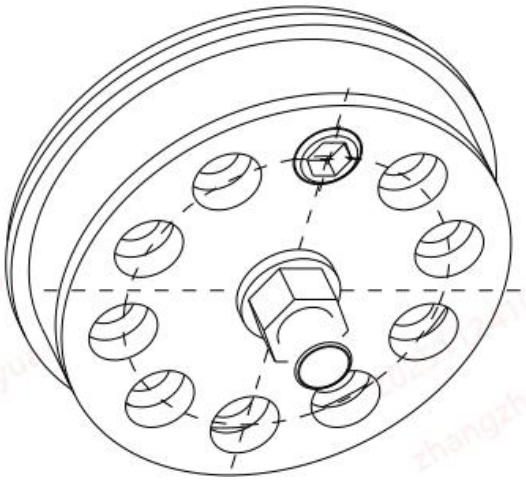

Figure 1. Rear Oil Seal Press Schematic

1.1 Positioning Mechanism

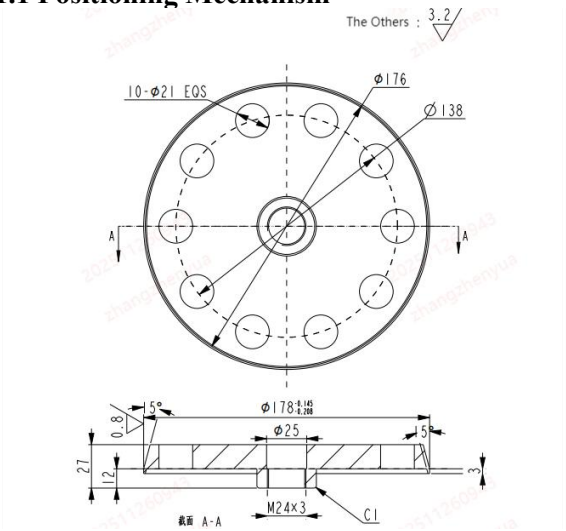

Figure 2. Illustration of the Positioning Mechanism

1.2 Guidance Mechanism

The guide mechanism contacts the rear oil seal directly and is positioned outside of the positioning mechanism to ensure the accuracy of the pressure direction and to ensure that the rear oil seal reaches a acceptable depth with the aid of the positioning mechanism, as shown in Figure 3.

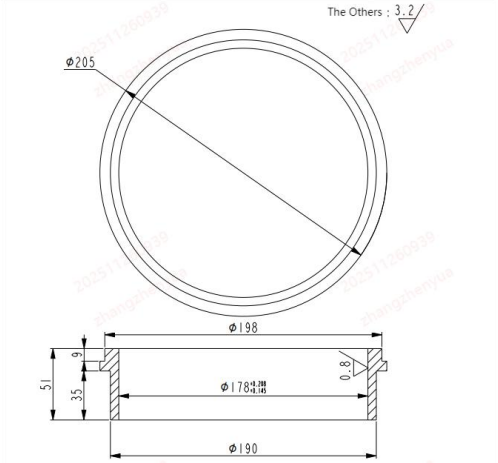

Figure 3. Schematic Illustration of the Guide Mechanism

1.3 Pressure agencies

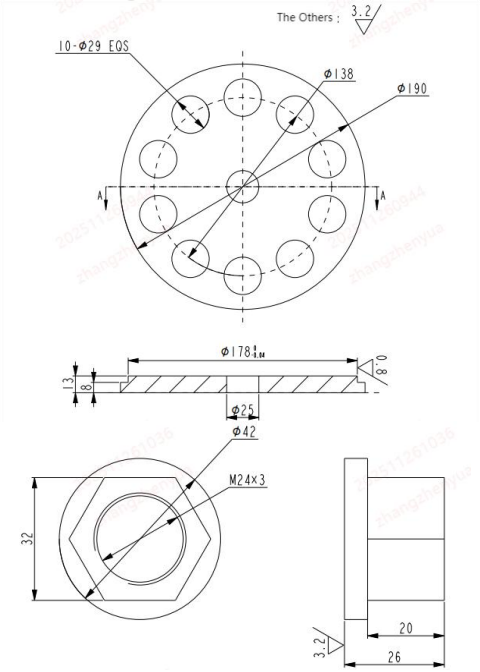

Figure 4. Pressure Mechanism Schematic

The pressure mechanism applies pressure to the entire unit, spreading pressure from the center evenly to the guide mechanism, ensuring that the seal pressure in depth and pressure is consistent at all times, as shown in Figure 4.

1.4 Auxiliary Support Assembly

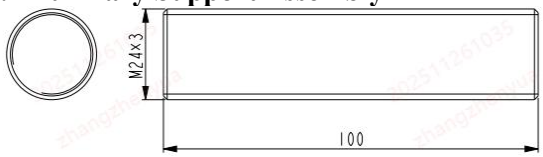

Figure 5. Illustration of the Auxiliary Support Assembly

The auxiliary support components run through the positioning mechanism, guidance mechanism, and pressure mechanism, and connect the above three parts into a single unit, effectively giving full play to the functions of each component, as shown in Figure 5.

2. Overall System Structure Principle

2.1 Overall Institutional Analysis of the System

The manual press-fit device is modular in design and consists mainly of positioning mechanism, pressure mechanism, guidance mechanism, and auxiliary support components. The overall structure is shown in Figure 6. The positioning mechanism is used for precise centering of the crankshaft and oil seal; the pressure mechanism provides uniform axial pressure through manual drive; the guide mechanism guarantees straight-line motion accuracy of the packing process; and the auxiliary support assembly is used to stabilize the fixture and engine crankshaft for increased assembly stability[4-6].

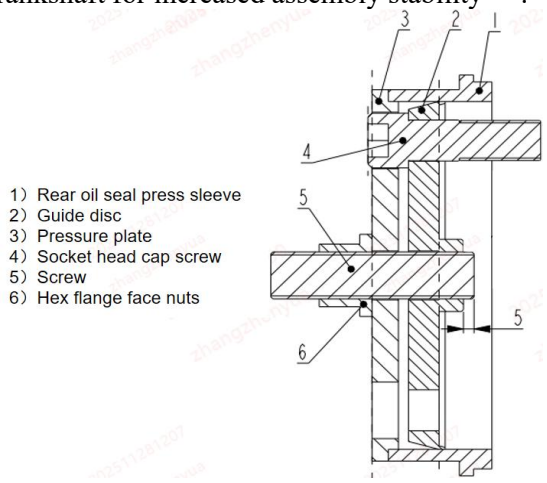

Figure 6. A Schematic Overview of the Overall System Structure

2.2 how the System Works

Install the rear oil seal through the guide plate on the crankshaft by first securing the guide plate to the crankshaft with socket head cap screws. After the pre-installation is complete, press the rear oil seal press sleeve and then the pressure plate through the screw. Tighten the hex flange nuts and apply the tightening feed force to the rear seal press sleeve evenly through the pressure plate, ensuring a uniform depth of pressure is applied at each position of the rear seal.

2.3 System Pros and Cons

The unit is simple in structure, simple in operation and low cost, and can effectively guarantee the consistency and conformity of the rear seal position. However, the overall weight of the unit is heavy due to material and can only be fitted to a single-size crankshaft, providing less flexibility.

3. Conclusions and Prospects

3.1 Conclusion

This paper has designed a manual rear oil seal press-fit device based on the crankshaft of a large bore engine, which, through the synergy of the positioning mechanism, the elastic pressure mechanism and the dual guidance mechanism, has achieved a precise and smooth assembly of

the oil seal. It has the characteristics of high positioning precision and good pressure stability.

3.2 Outlook

The unit performance can be further optimized in the following ways: (1) increase the pressure display function, Increase operational intuitiveness through real-time feedback of compressive forces through embedded pressure sensors and displays; (2) design of quick-change retainer sleeves and pressure plate assemblies to fit more specification oil seals and crankshaft for versatility of lifting devices; and (3) design with lightweight materials and optimized structures. Further reduce unit weight and increase portability.

4. Concluding Remarks

In summary, the rear oil seal press-fit unit highlights significant advantages in the installation of the rear oil seal of a large bore engine. It not only solves the pain points of the rear oil seal being incorrectly installed, it also avoids the traditional installation method and the rear oil seal is easily offset, Skewed Equal quality defect issue. In effect, the unit guarantees the rear seal installation pass, while significantly improving assembly efficiency and reducing operator labor intensity. With the increasing requirements of the engine manufacturing industry for the quality of rear seal installation and productivity, these attachments have broad application prospects and promotional value, and are expected to inject new vitality into the industry's development and push engine manufacturing toward higher quality and higher efficiency.

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