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Translation Strategy and Practice of Mechanical Patent Specifications from the Theory of Functional Equivalence

Hua Chai[1,*]
[1] *Yulin University, Shaanxi, China*

Abstract: Mechanical patent specifications are carriers of technological innovation, and their translation not only needs to accurately convey the technical information of the source language, but also conforms to the expression habits of the target language, so as to ensure that readers in cross-cultural and cross-linguistic backgrounds can understand and apply the relevant technologies. The purpose of this paper is to explore the translation strategy of mechanical patent specifications under the guidance of the theory of functional equivalence, so as to make the translated text functionally the same as the source language through the techniques of lexical, syntactic, chapter and style equivalence. To this end, this paper adopts the method of literature analysis, through combing the relevant theories and research results, and analysing the translation strategies in practice with actual cases. Through such research, this paper strives to provide effective guidance for the translation of mechanical patent specifications within the framework of the functional equivalence theory, and to promote the accurate communication and smooth application of patent information in international technical exchanges.

Keywords: functional equivalence theory; mechanical; patent specification; translation

Introduction

Translation of mechanical patent specifications is a key link in international technology exchange and intellectual property protection, and its translation is different from ordinary text translation, as its content contains a large number of technical terms, complex syntax and strict logical structure, and the slightest negligence may lead to bias in technical understanding, which affects the application of technology in the international market and the protection of law. Therefore, how to achieve functional equivalence between the original text and the translated text, i.e., to ensure that the translated text is consistent with the original text in terms of the accuracy of the content, the rigour of the logic and the professionalism of the style, has become the core challenge of mechanical patent translation.

1. Basic Concepts of Functional Equivalence Theory

1.1. Core concepts of functional equivalence theory

Proposed by Eugene Naida, the theory of functional equivalence emphasises the achievement of functional equivalence between source and target languages in the process of translation, rather than mere literal correspondence. The theory distinguishes between two types of reciprocity, “formal reciprocity” and “dynamic reciprocity”, in which dynamic reciprocity is particularly concerned with making the translated reader feel the same impact as the source reader (Wu et al., 2022). According to Naida, successful translation should enable the target language readers to understand and feel the meaning and emotion conveyed by the source language text, which involves multiple levels of lexical, syntactic, chapter and stylistic equivalence. Lexical equivalence emphasises the precise transformation of terms and expressions; syntactic equivalence involves the similarity of grammatical structures; chapter equivalence is concerned with the logical

Corresponding Author: Hua Chai
Yulin University, Shaanxi, China
Email: 515508552@qq.com

consistency of the organisation of information; and stylistic equivalence requires that the translation conveys the same style and tone (Wang, 2021). Functional equivalence theory puts special emphasis on the purposefulness of translation and readers' response, and advocates that translation should be adapted to the cultural and linguistic environment of the target language on the basis of maintaining the information and intention of the source language, so as to achieve equivalence in the true sense.

1.2. Applicability of functional equivalence theory in technical translation

Functional equivalence theory is highly applicable in technical translation, because the core goal of technical translation is to ensure that the information conveyed in the translated text is accurate, clear and operable, and the functional equivalence theory can well meet this demand (Song, 2020). Technical translation often involves a large number of technical terms, complex syntactic structures and rigorous logical relationships, which requires the translator not only to pay attention to the vocabulary and structural correspondences on the surface of the language, but also to reproduce the functionality of the original text in the translated text, so that the target readers can fully understand and apply the information conveyed. Through functional equivalence, the translator can maintain the accuracy and consistency of the technical content while making appropriate adjustments according to the linguistic habits of the target language and the needs of the readers, so as to make the expression of information more fluent and easy to understand. Specifically, technical translation under the guidance of the theory of functional equivalence is able to maintain the consistency and standardisation of terminology in terms of vocabulary selection, improve the readability of information by optimising the structure in terms of syntax, and approach the professionalism and precision of the source language in terms of chapter organisation and stylistic style.

2. The Textual Characteristics of the Mechanical Patent Specification

2.1. Language characteristics of patent specifications

The language characteristics of mechanical patent specifications are highly professional, precise and logical, and usually adopt objective, direct and standardised language to ensure the clear communication of technical information and legal effect. Long sentences and complex structures are common in patent specifications, reflecting the need for detailed descriptions of mechanical devices and their working principles, and these sentences are often layered and logical to ensure the accurate expression of every detail and step (Peng & Li, 2020). Passive voice is particularly common in such texts, intended to dilute the subjective component and highlight the objectivity and repeatability of the process or state. In addition, mechanical patents make extensive use of technical terms and specific expressions that are clearly defined and have specific meanings in the technical field, avoiding any ambiguity or ambiguity in order to protect the uniqueness and enforceability of the patent. A large amount of data, dimensions and parameters are also common in the description to ensure the accuracy of the technical content; meanwhile, the structure of the content of the specification is usually divided into parts such as background technology, specific embodiments and claims, each of which is unfolded in strict accordance with the formatting specifications of the patent documents, so that the patent examiners and technicians can accurately comprehend the technical solutions when reading them.

2.2. Functional requirements of patent specifications

The functional requirements of mechanical patent specifications are mainly reflected in clearly and precisely conveying the details of the technical programme, and ensuring that it is comprehensible and operable, in order to support the protection of the patent right and the practical application of the technology. Such specifications are required to firstly provide the complete technical background, the content of the invention and the specific implementation method, so that the technical

personnel can reproduce and implement the patent programme without ambiguity, thus achieving the following The core requirement of "enforceability" (Jin & Gao, 2017). As the patent specification assumes the function of legal documentation, its content must be unique and exclusive to ensure that the patentee's technological innovation is not copied or infringed, so the description in the specification not only needs to be detailed but also needs to be logically rigorous, so as to provide sufficient technical support in the examination and legal proceedings. On the other hand, the content of the patent specification should be universal, i.e., professionals in different countries and cultures can accurately understand and reproduce the technical points therein, which requires a high degree of standardisation in language expression, avoiding ambiguous or misunderstanding-prone expressions, so as to ensure that the technical solutions have a consistent understanding of the standard in the global arena.

3. Translation Strategies Guided by Functional Equivalence Theory

3.1. Lexical equivalence

Vocabulary equivalence in mechanical patent specifications emphasises accurate and natural terminology communication between the source language and the target language to ensure the professionalism and practicability of the translated text. The vocabulary equivalence strategy not only requires direct translation, but also needs to adjust the terminology selection appropriately according to the target language's technical habits and ways of understanding, so as to make the translated text not only convey the original meaning, but also conform to the reading habits of the target language. In the process of translation, it is especially important to avoid word-by-word and sentence-by-sentence rigid correspondence to ensure the professionalism and consistency of key terms. For example, in a mechanical patent specification, the English term "tolerance" usually means "公差" in mechanical engineering, i.e. the permissible error range of a component. If "tolerance" is rendered as "容忍" or "忍受" in the Chinese translation, although the literal meaning is similar, it will lead to misunderstanding in the mechanical context, affecting the rigour and enforceability of the patent document. The rigour and enforceability of the patent document will be affected. Therefore, adopting the functional equivalence strategy, the translator should give priority to the standard terminology in the target language, and accurately translate "tolerance" into "公差" to ensure the professionalism and accuracy of the translation. In addition, this term usually appears together with numerical values, standard values and other data in patent specifications, so it is necessary to strictly maintain the consistency of the context in the expression, so that readers can understand this key parameter without ambiguity. The lexical equivalence strategy under the theory of functional equivalence plays an important role in this kind of translation to ensure that the terminology is conveyed accurately and adapted to the technical expression habits of the target language, which contributes to the consistency and comprehensibility of the patent specification in different languages and cultures.

3.2. Syntactic equivalence

Syntactic equivalence in mechanical patent specifications aims to ensure that complex technical descriptions and logical structures in the source language can be accurately and smoothly conveyed to the target language readers in the translated text. Mechanical patent specifications usually contain a large number of long and complex sentences, and translating them word by word and sentence by sentence may lead to obscure and difficult-to-understand translations, which will affect the clarity of the technical information and the readability. Therefore, the syntactic equivalence strategy focuses on how to maintain the logic and technical accuracy of the original text while adjusting the sentence structure to make it conform to the expression habits of the target language, so as to enhance the comprehensibility of the translated text. Taking the English sentence "Upon applying force to the assembly, the cylindrical component moves

vertically within the housing, creating a seal at the interface" as an example, a word-for-word translation such as "在施加力量于组件时，圆柱部件在壳体内垂直移动，在界面处形成密封" appears lengthy in Chinese and does not align with the logical flow of a Chinese sentence. By adopting the syntactic equivalence strategy, the sentence can be adjusted to "施加力量后，圆柱部件在壳体内垂直移动，在界面处形成密封", which not only retains the logical relationship and technical information of the original sentence, but also conforms to the concise expression of the Chinese language to make the translation clearer and more comprehensible. Through such syntactic adjustments, the syntactic equivalence strategy achieves effective communication of the original information and ensures that the translated text has the accuracy and readability of a technical document.

3.3. Chapter equivalence

Chapter equivalence means that the translation should maintain the information structure and logical coherence of the source text, and at the same time adapt the chapter layout to the expression habits of the target language, the key is to ensure that the translation is not only accurate in terms of technical content, but also easy to be understood by the readers of the target language in terms of the organisation and presentation of information. For example, when translating a patent paragraph involving multi-step operations, the original text may introduce each operation step by step in chronological order, and this structure may not be appropriate in some languages. In an example of translation from English to Chinese, the original text may be expressed as follows: "First, place the component in the device. Next, adjust the settings according to the specifications. Finally, activate the device to start the operation." If translated directly into Chinese: "首先，将组件放置在设备中。接下来，根据规格调整设置。最后，激活设备开始操作." Although this translation retains the logic of the original, Chinese expressions usually prefer a more concise formulation, so a better chapter-to-chapter translation would be: "将组件放置设备中，按规格调整设置后，启动设备进行操作." Such a translation is not only concise, but also more in line with the logic of Chinese expression, which is easy to understand and operate. Through the chapter equivalence strategy, the translation work helps the source language information to better adapt to the target culture and the reading habits of the readers while maintaining the original meaning, ensuring the effect of information transfer and the actual function of the application, which is crucial for the international application of patent documents and technology dissemination.

3.4. Stylistic equivalence

The translation of mechanical patent specifications needs to pay attention to stylistic equivalence to ensure that the translated text is consistent with the source text in style and tone, and at the same time conforms to the norms of professional expression in the target language. The style of a mechanical patent specification usually requires simplicity, objectivity and precision in order to convey a clear message at both the technical and legal levels. Stylistic equivalence strategy aims to make the translated text have the same professionalism and rigour in expression, avoiding unnecessary emotional colours or rhetorical devices. For example, when dealing with a sentence whose source text is "The device should be assembled with caution to avoid potential damage to the sensitive parts", if it is directly translated as "设备应小心组装，以避免对敏感部件造成潜在损坏", although it conveys the original meaning, it is slightly redundant in the Chinese patent context. According to the strategy of stylistic equivalence, the translator can adjust it to "设备需谨慎组装，以免损坏敏感部件". This expression is more concise and direct, in line with the style specification of Chinese technical documents, and retains the directive and professionalism of the source text. In addition, this adjustment makes the translation logically more concise, avoids possible comprehension barriers, and enhances the practicality and operability of the text. The application of the stylistic equivalence strategy makes the translated text not only conform to the expressive norms of the target language, but also be

stylistically faithful to the technical rigour and objectivity of the original text, which provides a strong support for the actual functionality of the patent specification.

4. Difficulties and Solutions in Translation Practice

4.1. Inconsistency of terminology

Inconsistency of terminology is one of the major difficulties in translating mechanical patent specifications, which directly affects the comprehensibility and professionalism of the patents. The mechanical field is full of proprietary technical vocabulary and complex concepts, and there may be differences in the expression of the same technical concepts in different language environments, which requires that the translator should not only be proficient in the two languages, but also need to have in-depth knowledge of the industry in order to ensure that the correctness and consistency of the terminology. An effective way to solve this problem includes the establishment and maintenance of a terminology database with detailed definitions and usage notes, ensuring that each term has a standard cross-reference and explanation to achieve terminology parity across languages (Fang, 2017). Terminology alignment by reference to international and industry standards is also a common strategy, which can be achieved through collaboration with industry experts and participation in professional translation societies. Timely review and proofreading during the translation process, as well as co-operative exchanges with other professional translators, are also important means of ensuring consistency and accuracy in the use of terminology. By adopting these strategies, translators can better cope with the problem of terminology inconsistency, ensure the professionalism and functional equivalence of mechanical patent specification translation, and ultimately improve the quality and practicality of the translation.

4.2. Handling of long sentences and complex structures

From the perspective of functional equivalence theory, dealing with long sentences and complex structures in mechanical patent specifications is a challenge in translation practice, because these structures often contain nested technical descriptions and multi-level information, which must be accurately conveyed to readers of the target language. The key to solving this problem is to reorganise and simplify sentence structures while ensuring that all technical details and functional intent are fully conveyed. An effective way to do this is to break long sentences into several short ones, which improves readability and reduces grammatical complexity while helping the target readers to better understand and assimilate the technical content. On the other hand, the logical connection between sentences can be strengthened through the appropriate addition of connecting words and transitional statements, thus maintaining the coherence of the chapter. In this process, translators need to pay close attention to the technical accuracy and logical structure of the original text to ensure that the translated text is not only faithful to the original meaning, but also conforms to the expression habits of the target language (Cai, 2015). Professional peer review and multiple proofreading are also important steps to ensure the quality of translation, through which misunderstanding and information loss during the process of splitting and reorganisation can be effectively avoided.

4.3. Response to Cultural Differences

The main cultural differences faced by mechanical patent specification translation include the cultural dependence of terminology, differences in units of measurement, and regional characteristics of technical practice, which may lead to understanding bias or misunderstanding by target language readers, and affect the global implementation and legal protection of patents. To address these cultural differences, it is first necessary to conduct in-depth cross-cultural research to understand the mechanical engineering practices, industry standards, and regulatory environment in the target culture. Translators can adopt a localisation strategy to convert technical terms and units in the

source text to their widely recognised and used counterparts in the target language environment, e.g. units of measure should be converted according to the standards of the target country to ensure that the accuracy of technical parameters and descriptions is not affected. For those technical terms or concepts for which no equivalent expression can be found directly, the translator should provide sufficient notes or explanations so that the reader can understand the original intent and technical depth (Fei, 2013). Throughout the translation process, communication and collaboration with professional peers is indispensable to help validate the accuracy of the translation and ensure that it meets the functional requirements of the industry, and these methods can be effective in overcoming cultural differences and achieving functional equivalence in translating mechanical patent specifications to support the internationalisation of patents and the exchange of technology in the global marketplace.

Conclusion

To sum up, the translation of mechanical patent specifications is not only about language conversion, but also about the guarantee of technical precision and legal validity. The translation strategy based on the theory of functional equivalence can effectively solve the common problems of comprehension obstacles and expression inconsistencies in cross-cultural contexts, so as to ensure that the translated text achieves the expected results in terms of professionalism, readability and cultural adaptability. Through the use of equivalence of vocabulary, syntax, chapter and style, the translator is able to faithfully present the technical intent of the original text in the translated text, laying a foundation for the global dissemination and application of the patent content.

Conflict of Interest

The author declares that she has no conflicts of interest to this work.

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