Markush, or Generic Structures

A large part of this issue of the *Journal of Chemical Information and Computer Sciences* is devoted to the problems of generic structures in patents—the so-called Markush structures. The use of generic structures in patents raises some very interesting issues which range from the legal and ethical, through business aspects to a series of fascinating technical and scientific problems as computers have been brought to bear on the subject. A full day of the Chemical Information Division program at the August 1990 meeting of the American Chemical Society was given over to papers dealing with the issues and these papers appear in this issue.

This brief introduction to the subject has been prepared by Edlyn Simmons, the Patent Information Supervisor at Marion Merrell Dow Inc., and provides definitions of some of the major terms used in connection with patents. It can be used therefore as a resource and may be helpful to those readers who are unfamiliar with the patent process.

A reading of papers dealing with the Markush problem requires a basic understanding of the patenting process. A **patent** is a legal document which confers on its owner, referred to as the **patentee**, the right to exclude others from making, using, or selling the **invention** claimed in the patent in the country whose government issued the patent. The patentee may be an individual or a team of **inventors** or a company or other organization that has acquired ownership of the patent rights as the employer of the inventors or by assignment, designated as the **assignee**. To obtain a patent, the patentee files a **patent application**, which is usually drafted by a legally qualified patent agent or attorney, in the national patent office. A patent application consists of formal application papers and a patent **specification**. The specification is a technical document that contains a description of the invention and comprises a **disclosure** of the method for making and using the invention and one or more **claims** that define the legal limits of the patent rights. In most countries, the patentee is entitled to claim an invention in broad generic terms as well as in specific terms, and most do so to ensure that competitors cannot avoid the patent by making minor changes in the claimed invention. To support the scope of the generic claims, the disclosure must describe the invention in sufficient detail to enable a person of ordinary skill in the art to practice the invention, providing definitions for generic terms and **examples** of specific embodiments of the invention. In chemical patents, generic inventions are typically disclosed in the form of a **Markush structure**, a chemical structure that contains one or more structural variables, defined by a list of alternatives. Markush claims cover each compound that can be constructed by combining the listed alternatives, not merely the exemplified specific compounds.

To obtain patent rights in more than one country, the patentee must file applications in each country. Regional patenting authorities, notably the European Patent Office (EPO), have been established to issue patents with legal effect in a group of countries, and the **Patent Cooperation Treaty (PCT)** allows applicants to use a single formal filing procedure to initiate patenting in a large number of countries. Each country has its own patent laws governing the kind of inventions that can be claimed in a patent application and the procedures for enforcing patent rights. Each patenting authority has its own rules for the processing of patent applications. In most countries, patent examiners review each patent application to determine whether the claims define a patentable product or process. United States patents are published by the United States Patent and Trademark Office (USPTO) after examination as granted patents, but most other patent offices publish the specifications of unexamined applications 18 months after they are filed, and the patents are republished when and if patent rights are granted. A patent is granted only if the claimed invention meets the country's standards of patentability, which invariably include: **novelty, utility, nonobviousness or inventiveness**, and **unity of invention**. Claims to inventions without an acceptable use are rejected for lack of utility. Applicants who attempt to claim more than one inventive concept are required to divide their claims into two or more **divisional applications**. **Novelty** and **inventiveness** are judged against the **prior art**, which consists of all published patents and non-patent literature as well as actual products and processes available to public scrutiny prior to the filing of the patent application. Patent offices maintain search files for the use of their examiners, with patents classified according to hierarchical systems, the most prominent of which is the International Patent Classification (**IPC**). Any document with a description that includes subject matter within the scope of the claims of a patent application under examination or which is so closely related that it would not require an inventive step to reach the claimed invention, is included in the examiner's search report or cited by the examiner when rejecting the claims. Applicants have the right to amend their claims to exclude the overlapping scope or to argue that the teachings of the prior art are insufficient to make the claimed invention old or obvious. If a specifically defined invention was claimed in an earlier, very broad patent, it is occasionally possible to obtain a **selection patent** by showing that the actual claimed product or process has advantageous properties differing from those taught by the generic prior art patent.

After publication of an examined patent, members of the public can oppose it or challenge its validity by citing references overlooked by the patent examiner, or irregularities in the prosecution of the application. The grant of a patent enables the patentee to sue anyone who infringes the patent by making, using, or selling a product or process covered by the claims contained in the patent. Competitors often avoid infringement of commercially successful patents by designing around them, making small changes in the claimed invention. Particularly in the United States, a product or process that performs substantially the same function in substantially the same way to produce substantially the same result constitutes infringement under the judicially created **doctrine of equivalents**. The range of equivalents afforded an invention by the doctrine of equivalents varies according to the wording of the patent disclosure, the differences between the patent claims and the prior art, and the prosecution history of the patent. Amending claims during prosecution to limit their scope or arguing that a particular limitation is essential to the invention results in **file wrapper estoppel**, which bars the patentee from later expanding the range of equivalents beyond those limitations. A patent remains in force during its statutory term only if maintenance fees are paid and the patent is not declared invalid in a court proceeding, but the patent specification remains forever a part of the prior art for later patent applications.