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n This Issue

- Glaxo: The New Role For The Justice Department
- Patent Licenses Under Government Contracts: New Judicial Scrutiny
- "Obvious" Differences—What Should The Points Of Reference Be?
- Measurement Of The Cumulative Effects Of Technology On Macroeconomic Growth

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CONTENTS

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Michael O. Sutton *

GLAXO: THE NEW ROLE FOR THE JUSTICE DEPARTMENT

The Supreme Court in its recent decision in *United States* v. *Glaxo Group Limited*[1] added a new wrinkle to the patent-antitrust confrontation—the Court, in effect, nourished a dormant power in the Justice Department to challenge the validity of any patent "involved in" an antitrust violation. Aside from any questions regarding the dominance of the two oppositely directed and competing theories underpinning the patent and antitrust doctrines, this decision invokes a flurry of inquiries into the propriety of the Justice Department's ability to collaterally attack the decisions of a fellow administrative agency, the Patent Office. The purpose of this article is to entertain some of those questions, to analyze the Court's reasoning in its decision and to examine the ramifications of its holding.

I. Synopsis of Facts and Holding

On April 26, 1960, Glaxo Group Limited (hereafter Glaxo) and Imperial Chemical Industries Limited (hereafter ICI), two British drug companies engaged in the manufacture and sale of drugs, entered into an agreement which provided *inter alia* that:

(a) ICI would purchase supplies of bulk form griseofulvin from Glaxo;
(b) ICI would not sell and would use its best endeavors to prevent its subsidiaries and associates from selling any griseofulvin in bulk to any third party without Glaxo's written consent;
(c) ICI was entitled to sell bulk form griseofulvin and preparations containing it in the United States;

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[1] 410 U.S. ....., 176 USPQ 289 (1973).

(d) ICI was authorized to sublicense under Glaxo's United States griseofulvin patents;[2] and
(e) Glaxo was authorized to sublicense Schering Corporation (hereafter Schering) and Johnson & Johnson, Inc. (hereafter J&J) in the United States to make, use and sell griseofulvin preparations.[3]

Prior to this agreement both ICI and Glaxo were parties to independent licensing agreements. Glaxo had entered into two separate agreements with Schering and J&J in 1959. These agreements expressly provided that the vendees, Schering and J&J, were prohibited from reselling bulk form griseofulvin whether patented or unpatented. ICI had entered into a contract constituting American Home Products Corporation (hereafter AMHO) as an exclusive distributor of ICI pharmaceutical products in the United States. After the ICI-Glaxo agreement had been consummated, a second agreement was reached between ICI and AMHO whereby:

(a) ICI agreed to sell bulk form griseofulvin to AMHO;
(b) AMHO was authorized to process the bulk form drug into tablets or capsules and to sell it in that form; and

[2] At the time the agreement was made Glaxo was the owner of U.S. Patent No. 2,843,527, July 15, 1958, entitled "Production of Griseofulvin in Low Nitrogen Level Medium". All claims in this patent were directed to the process of producing griseofulvin. Subsequent to the agreement, Glaxo acquired the ownership of the following U.S. Patents which apparently became subject to the agreement: 2,938,835, May 31, 1960, "Production of the Mutants of the Genus Penicillin", which included claims directed to the method of producing an organism from a parent strain of griseofulvin; 2,986,496, May 30, 1961, "Production of Antibiotics and Antibiotic-Containing Products", which included claims directed to another method of producing griseofulvin; 3,008,876, November 14, 1961, "Combinations Containing Griseofulvin", which included claims drawn to a composition of matter comprising griseofulvin dissolved in a solvent; and 3,330,727, July 11, 1967, "Griseofulvin with High Specific Surface Area", which included claims directed to a finely ground (microsize) form of griseofulvin.

[3] ICI was the owner of U.S. Patent No. 2,900,304 (not 2,900,204 as reported by the Court), August 18, 1959, "Griseofulvin Uses and Compositions". This patent included two different types of claims: (1) claims directed to the process of administering griseofulvin *internally* to cure *external* fungus diseases and (2) claims directed to a composition in shaped dosage form comprising griseofulvin and a pharmaceutical carrier.

(c) AMHO was restrained from reselling any bulk form drug to third parties.

On March 4, 1968, the United States filed a civil antitrust action against Glaxo and ICI under Section 4 of the Sherman Act[4] charging the defendants with violating Section 1[5] of the Act on the narrow issue of the *resale* restrictions included in the various agreements.[6] The Government also included within the original complaint a challenge to the validity of ICI's patent. In response to this challenge, ICI filed an affidavit disclaiming any desire to rely upon its patent as a shield for the alleged antitrust violations. This manuever was taken to remove the patent from a government challenge permissible under *United States* v. *United States Gypsum Co.*[7] The Government responded by arguing that it had

[4] 26 Stat. 209 (1890), 15 U.S.C. sec. 4 (1958).

[5] 15 U.S.C. sec. 1 (1958).

[6] This case was not brought to test the validity of bulk *sale* restrictions included in the manufacturing licenses under the patented processes. See McLaren, "Patent Licenses and Antitrust Consideration", 5 C.C.H. Trade Reporter, Para. 50,246 (1969) and Donnem, "Antitrust Attack on Restrictive License Provisions", 5 C.C.H. Trade Reporter, Para. 50,260 (1969). The majority of the Supreme Court erroneously stated that the Government challenged the validity of the *sale* and *resale* restrictions. 410 U.S. at ....., 176 USPQ at 290. The Court also erroneously stated that the district court held the *sale* restrictions to be *per se* restraints of trade. 410 U.S. at ....., 176 USPQ at 291. Justice Rehnquist noted these errors in his dissenting opinion at 410 U.S. ....., 176 USPQ at 295, footnote 4. Although this error apparently had no effect on the outcome of the decision, a clear distinction between the two restraints must be realized. It has uniformly been held that the sale of a patented item extinguishes the patentee's power thereover, Ethyl Gasoline Corp. v. United States, 309 U.S. 436 (1940); United States v. Univis Lens Co., 316 U.S. 241 (1942). Therefore, a restraint on a purchaser's ability to *resell* an item falls within the purview of the *Schwinn* doctrine, even though the item sold is patented. See footnote 10, *infra*. However, a provision in a patent license restricting the licensee in his ability to *sell* the product which he is being permitted by the patentee to make may fall in the class of restraints which are considered to be within the reward of the patent grant. Cf. United States v. General Electric Co., 272 U.S. 476 (1926), upholding the patentee's ability to fix the prices at which a manufacturing licensee may initially sell the patented goods; General Talking Pictures Corp. v. Western Electric Co., 305 U.S. 124 (1938), upholding that a patentee may limit the field in which a manufacturing licensee may sell the products made under the patent license.

[7] 333 U.S. 364 (1948).

an inherent authority to challenge any patent in order to vindicate the public policy favoring invalidation of specious patents. Furthermore, the Government advanced the more limited position that the *Gypsum* case should be understood to empower a government challenge to any patent used by a defendant to carry out an antitrust violation.[8]

Also in the original complaint, the Government requested the remedy of compulsory licensing of the patents and compulsory sales of bulk griseofulvin at reasonable, nondiscriminatory royalties and prices, respectively, in order to overcome the anticompetitive market structure fostered by the resale restrictions.

Later, the Government attempted to amend its complaint to challenge the validity of Glaxo's recently issued patent on the finely ground or "microsize" form of griseofulvin.

In a partial judgment rendered on June 4, 1969,[9] pursuant to several motions for summary judgment by the several parties to the action, the district court (1) declared the ICI-AMHO resale agreement to constitute a *per se* violation of the Sherman Act under the *Schwinn* doctrine,[10] (2) refused to permit the Government to challenge the ICI patent, and (3) denied the Government's motion to amend its complaint to challenge the Glaxo "microsize" patent.

In an unofficially reported order issued November 20, 1969,[11] the Glaxo-J&J and Glaxo-Schering resale agreements were held to be in *per se* violation of the Sherman Act.

In an unofficially reported order issued April 30, 1970,[12] the Glaxo-ICI horizontal resale agreement was held to be in *per se* violation of the Sherman Act insofar as the agreement applied to United States vendees.

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[8] See Reply Brief for the United States, footnote 1.
[9] 302 F. Supp. 1 (D. D.C. 1969).
[10] In United States v. Arnold, Schwinn & Co., 388 U.S. 365 (1967), the Court held that a reservation of power by a seller to control the resale by his buyer-vendee is so obviously destructive of competition as to constitute a *per se* violation of Section 1 of the Sherman Act.
[11] 1970 Trade Cases, Para. 73,000 (D. D.C.).
[12] 1970 Trade Cases, Para. 73,189 (D. D.C.).

In a final judgment rendered June 17, 1971,[13] the district court refused to compel Glaxo and ICI to sell bulk griseofulvin and to license their patents to any applicant. However, the court did not merely limit its injunctive order to restricting the resale agreements found to be antitrust violations. Rather, the court deemed it appropriate to also enjoin the defendants from entering into any agreement which would restrain a licensee in *selling any* drug.[14]

The government appealed pursuant to Section 2 of the Expediting Act.[15] The Supreme Court noted probable jurisdiction[16] and subsequently *held,* reversed and remanded: where patents are involved in an antitrust violation and the Government presents a substantial case for relief in the form of limiting the bundle of rights under those patents, the Government may attempt to prove that any or all of those patents are invalid regardless of whether or not the owner relies upon the challenged patents in defending the antitrust action; further, compulsory licensing and mandatory sales, well established forms of relief in antitrust actions, should be imposed when a patent provides the economic leverage to enforce the antitrust violation and such relief is necessary to pry open the market for further competition.

II. History of Permissible Patent Challenges

Under the Patent Acts of 1790[17] and 1793,[18] private citizens were permitted access to district courts to allege fraudulent procurement of a patent and thereby secure an order directed to the patentee to show cause why his

[13] 328 F. Supp. 709 (D. D.C. 1971).

[14] See the Final Decree, paragraph IV(D). [Emphasis added]. In all fairness to the Supreme Court, this portion of the decree may be the source of confusion referred to in footnote 6, *supra,* regarding the manufacturing sale restriction.

[15] 15 U.S.C. sec. 29 (1958): In every civil action brought in any district court of the United States under any of said (antitrust) Acts, wherein the United States is complainant, an appeal from the final judgment of the district court will lie only to the Supreme Court.

[16] 405 U.S. 914 (1972).

[17] 1 Stat. 109 (1790).

[18] 1 Stat. 318 (1793).

patent should not be repealed. However, this system of challenging patents was eliminated from the Patent Act of 1836.[19] When called upon to elaborate upon this omission, the Supreme Court in *Mowry* v. *Witney*[20] concluded that the abrogation of the private action to cancel patents was a result of Congressional recognition that if fraud "has been practiced on the government . . . it is the appropriate party to . . . seek relief."[21] When the Government later sued, alleging fraud, to set aside two patents issued to Alexander Graham Bell, the Court relied heavily upon their conclusions in *Mowry*. In *Bell* I[22] the Court stated:

> That the government . . . should find it to be its duty to correct this evil, to recall these patents, to remedy this fraud, is so clear that it needs no argument. . . .[23]

The Court later had a chance in *Bell* III[24] to clarify some loose language in its *Bell* II[25] opinion and stated:

> Least of all was it intended to be affirmed that the courts of the United States, sitting as courts of equity, could entertain jurisdiction of a suit by the United States to set aside a patent for an invention *on the mere ground of error of judgment on the part of the patent officials*. That would be an attempt on the part of the courts in collateral attack to exercise an appellate jurisdiction over the decisions of the Patent Office, although no appellate jurisdiction has been conferred. . . .[26]

Thus, the Government was recognized as having an inherent authority to bring an action to cancel a patent only in the situation where the patentee had not dealt fairly with the Patent Office.

Since the time of the *Bell* cases, the patent laws have been amended six times with respect to the procedures of the Patent Office for examining and reviewing patents and the subsequent judicial review of such administra-

[19] 5 Stat. 117 (1836).
[20] 81 U.S. 434 (1871).
[21] Id. at 441.
[22] United States v. Bell Telephone Co., 128 U.S. 315 (1888).
[23] Id. at 370.
[24] United States v. Bell Telephone Co., 167 U.S. 224 (1897).
[25] United States v. Bell Telephone Co., 159 U.S. 548 (1895).
[26] 167 U.S. at 269. [Emphasis added].

tive determinations.[27] However, there has never been any provision included within the Patent Code establishing the right of the Justice Department to challenge patent validity. Congress has had under consideration several proposals to confer on the United States and other persons a right to institute proceedings in the Patent Office to cancel or revoke patents, with provision for court review,[28] but no such proposal has been reported out of Committee. However, during this same interim since *Bell* III, and especially within the past quarter-century, the judicial arena has sanctioned several patent-challenge situations. In *Kerotest Mfg. Co.* v. *C-O-Two Fire Equipment Co.*,[29] the Supreme Court held that patent validity may be tested in a declaratory judgment action brought by an unlicensed competitive manufacturer even though the patentee has not brought

[27] Act of March 2, 1927, 44 Stat. 1335-7; Act of March 1927, 44 Stat. 1394; Act of March 2, 1929, 45 Stat. 1475; Act of Aug. 5, 1939, 53 Stat. 1212; Act of March 4, 1950, 64 Stat. 11; Act of October 31, 1951, 65 Stat. 728.

[28] See, for example, House of Rep. Doc. No. 239, 78th Cong. 1st Sess. (1943), containing a recommendation by the National Patent Planning Commission, established by Executive Order of December 12, 1941; Proposed Revision and Amendment of the Patent Laws: Preliminary Draft with Notes, House of Rep. Committee on the Judiciary (1950); S. Res. 92, Senate Report No. 1464, p. 13, 84th Cong., 2d Sess. (1956); Senate Doc. No. 5, 90th Cong., 1st Sess., pp. 37-48, containing a recommendation by the President's Commission on the Patent System (1966); S. 643, 92d Cong., 1st Sess. (a revised Committee print of which appears in Patent, Trademark & Copyright Journal, October 28, 1971, pp. D1-17). Specifically, Sections 191 and 192 of S.643 provide that any person (presumably including the Government) may within a specified period of time notify the Patent Office of matters relevant to the validity of an issued patent, and thereupon request that the patent be reexamined. A bill similar to S.643 will presumably be introduced before the 93d Session of Congress; S.1321, introduced by Senator Hart on March 22, 1973, and reported in the Congressional Record, pp. S5378-S5392, also proposes that the Government would be able to bring information before the Patent Office concerning the patentability of an application. Specifically, Sec. 122 provides that the Patent Office shall make public all applications (except those kept secret because of national security under Sec. 181) prior to the first date of examination. Sec. 135 provides that any party (which under Sec. 100(h) is defined as including the Government) may, after an application has been made public and before a notice of allowance has been mailed to the inventor, notify the Patent Office of any information which may have a bearing on the patentability of any claim in the patent application.

[29] 342 U.S. 180 (1952).

an infringement suit. In *Walker Process Equipment, Inc.* v. *Food Machinery & Chemical Corp.*,[30] the Supreme Court held that a defendant in an infringement suit can do more than defend the suit on the traditional ground of invalidity—he may also counterclaim for monopolization in violation of Section 2 of the Sherman Act based upon the maintenance and enforcement of a patent that is invalid because it was procured by fraud on the Patent Office.[31] The Court has also held that a private licensee-plaintiff in an antitrust suit may attack the validity of the patent under which he is licensed even though he has agreed not to do so in his license.[32] As a corollary to this last proposition, the Court held in the *Gypsum* case that the Government is entitled to attack the validity of patents relied upon to justify conduct which would be violative of the antitrust laws but for the protection of the patent grant. And more recently, the Court in *Lear* v. *Adkins*[33] overruled a portion of its decision in *Automatic Radio Mfg. Co.* v. *Hazeltine Research, Inc.*[34] to hold that a licensee may challenge the validity of the patent under which he is licensed.

III. History of Compulsory Patent Licensing[35] As A Remedy In An Antitrust Action

Section 4 of the Sherman Act provides that the several district attorneys of the United States, under the direc-

[30] 382 U.S. 172 (1965).

[31] It must be noted that the Court did not eliminate the requirement of proving that the patentee monopolized a relevant market in order to be successful in his counterclaim.

[32] See, for example, Edward Katzinger Co. v. Chicago Metallic Mfg. Co., 329 U.S. 394 (1947).

[33] 395 U.S. 653 (1969).

[34] 339 U.S. 827 (1950).

[35] Although compulsory licensing as a remedy in an antitrust suit did not accomplish Supreme Court recognition until 1945, this form of relief in patent misuse cases dates back to 1917, but not by the name of compulsory licensing. In Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502 (1917), the Supreme Court established that relief will not be granted a patentee who is misusing his patent. Such a decree is tantamount to compulsory licensing (royalty free) because the patentee is unable to collect damages for infringement or secure an injunction against future infringement until he has purged himself of the misuse. Subsequent cases to the same effect are: Carbice Corp. of America v. American Patents De-

tion of the Attorney General, have a duty to initiate suits in equity to prevent violations of the Act and that the district courts have jurisdiction to entertain such suits. That section does not, however, set forth the types of relief which may be granted by a district court, but only states that the court shall proceed to hear and determine the case.

From 1890 until 1945 the types of relief decreed in patent-antitrust suits brought under Section 4 consisted of (1) injunctions against repetition of the acts found to have been in violation of the Act, (2) general injunctions against violating the Act, and (3) relief unrelated to patents.[36] However, in 1945 the Supreme Court in *Hartford-Empire Co.* v. *United States*[37] upheld the district court decision[38] which ordered the compulsory licensing of patents held by the defendants. This decision not only firmly entrenched such a remedy into patent-antitrust jurisprudence but also laid the foundation for governmental challenges to the validity of patents involved in antitrust suits.[39]

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velopment Corp., 283 U.S. 27 (1931); Leitch Mfg. Co. v. Barber Co., 302 U.S. 458 (1938); B. B. Chemical Co. v. Ellis, 314 U.S. 495 (1942); Morton Salt Co. v. G. S. Suppiger Co., 314 U.S. 488 (1942); Mercoid Corp. v. Mid-Continent Investment Co., 320 U.S. 661 (1944). Similar results have been reached where a patentee was suing to enforce provisions of a licensing agreement or to collect royalties: Sola Electric Co. v. Jefferson Electric Co., 317 U.S. 173 (1942); Edward Katzinger Co. v. Chicago Metallic Mfg. Co., 329 U.S. 394 (1947); MacGregor v. Westinghouse Electric & Mfg. Co., 329 U.S. 402 (1947).

[36] Frost, Oppenheim and Twomey, *Compulsory Licensing and Patent Dedication Provisions of Antitrust Decrees—A Foundation for Detailed Factual Case Studies*, 1 J. Res. and Ed. (Idea) 127,131 (1957).

[37] 323 U.S. 386 (1945); clarified and added to in 324 U.S. 570 (1945). Also involved in this case was the question of whether or not royalty free compulsory licensing is a proper remedy under Section 4. This topic is beyond the scope of this article, but for a good discussion of royalty free compulsory licensing and other controversial relief decrees see Hollabaugh and Rigler, *Scope of Relief in Government Patent and Know-How Antitrust Cases*, 28 Pitts. L.R. 249 (1966). For an in depth discussion of the *Hartford-Empire* case see Comment, *Compulsory Patent Licensing by Antitrust Decree*, 56 Yale L.J. 77 (1946).

[38] United States v. Hartford-Empire Co., 46 F. Supp. 541 (N.D. Ohio 1942).

[39] The Court reasoned in the Glaxo case that since a court entertaining a patent-antitrust suit must look into the future enforceability of a patent when deciding the issue of compulsory licensing,

By the time that the Supreme Court heard the *Hartford-Empire* case, many factors had combined to pave the way for their precedential holding. First, compulsory licensing had been consented to in several lower court suits within the preceding five years,[40] the first such consent decree appearing in *United States* v. *Kearney & Trecker*[41] in 1941. But more importantly, at that particular time in history patent practices were under severe attack from various sectors. Many charges had been made that the practices of the American business enterprise had hurt the military efforts of the allies while strengthening those of the axis powers. Moreover, the Temporary National Economic Committee had prepared a sharply critical report[42] directed at the glass container industry's patent practices, which practices eventually formed the basis for the Government's suit in the *Hartford-Empire* case.

The facts of the *Hartford-Empire* case were that several defendants had pooled and cross-licensed their patents to regiment the production and price policies of the glass container industry and to thereby completely dominate the field. Specifically, Hartford-Empire, a patent development company controlling more than 600 patents

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that court can easily check into the validity of a patent involved in the compulsory licensing question. See a more detailed discussion, *infra* at pages 493-495.

[40] The significance of such previous consent decrees dwells in the fact that the Court is probably influenced by the general attitude in the business community as to the fairness of such decrees. The consideration of such evidence seems wholly appropriate especially where the underlying measuring factor is the due process clause, which is apparently the proper Constitutional standard for judging the propriety of a compulsory license decree because such involves the taking of someone's property. See Mapp v. Ohio, 367 U.S. 643 (1961), wherein the Court based its decision of fairness in a criminal suit on the general attitudes of fairness then existing within the nation.

[41] C.C.H. Trade Cases 1940-1943, p. 571 (N.D.| Ill.). Other cases in which compulsory licensing was consented to prior to *Hartford-Empire* are: United States v. Whitehead Brother, C.C.H. Trade Cases 1940-1943, p. 665 (S.D. N.Y.); United States v. General Electric Co., C.C.H. Trade Reg. Serv., Para. 52,777 (D.C. N.D. 1942); and United States v. American Bosch Corp., C.C.H. Trade Reg. Serv., Para. 52,888 (D.C. N.Y. 1942).

[42] Final Report and Recommendations of the T.N.E.C., Document No. 35, 77th Cong. 1st Sess., pp. 36-7.

on glass making machinery, had been given control of gob-feeding and forming machines, Owens-Illinois Glass Company had been granted control over the suction feeding process of making glass containers, Corning Glass Works had been granted the exclusive operation in the noncontainer field, Thatcher Manufacturing Company had been granted the exclusive operation in the milk bottle field, and a major portion of the fruit jar line had been allotted to Ball Company. Furthermore, the defendants were found to have filed patent applications for the sole purpose of trying to fence in particular inventive areas and thereby forestall further competition. On the basis of the historical setting previously discussed and the particular facts of this case, it is not difficult to see why the Supreme Court considered it wholly appropriate and necessary to recognize an inherent power of a district court sitting in equity under Section 4 to require patents to be licensed in appropriate circumstances. It is also apparent that in the *Hartford-Empire* case the patents, at the very least, enabled the defendants to combine to attain the market dominance they enjoyed. A decree which would have only required the defendants to cease the cross-licensing and pooling agreements would not have broken down the illegally acquired market dominance and would therefore have been insufficient.

The next opportunity for the Supreme Court to further develop the concept or compulsory patent licensing came in 1947 in *United States* v. *National Lead Co.*[43] Although the Court upheld the district court decree of compulsory licensing at reasonable royalties, the underlying fact situation and the extent of the antitrust violation would lead one to conclude that the Court did not expand the range of permissible application of such a decree.

In that case a powerful international organization had been built primarily through the use of a patent pooling agreement. But worse yet, the members of this organization, which had gained domination of the entire titanium industry, had been assigned regions of the world

[43] 332 U.S. 319 (1947).

in which they could sell free of competition from other members. Therefore, as in the *Hartford-Empire* case, there existed the main elements which required the decree of compulsory licensing: (1) the flagrancy of the violation, and (2) the inevitableness that merely enjoining the antitrust violations would not foster competition among the members of the organization, who had acquired a monopolistic power, and would not eliminate the inherent barriers to competition from individuals outside the organization.

The Court was again confronted with a compulsory licensing question in 1947, but their decision again did not appreciably expand the area in which such a decree should be granted. In *International Salt Co.* v. *United States*[44] the Court found that the defendant, International, had violated the antitrust laws by illegally employing a tying arrangement in leasing its patented salt dispensing machines by requiring the lessees to purchase all salt for use in the patented machines. The decree issued by the Court in that case required the defendant to *nondiscriminatorily* lease, sale, or license his machines.

Two things should be recognized in connection with this case. First, the particular antitrust violation was not, in one sense, as flagrant as in the two previous cases because an entire industry had not been regimented or monopolized; however, in another sense the violation was indeed flagrant—the tie-in constituted a *per se* violation, which is viewed as being so inherently destructive of competition as to be incapable of justification or social redeeming value. Secondly, the patents which were required to be licensed were so factually related to the illegality that the particular decree was necessary in order to make sure that more favorable terms were not given to customers who purchased all or substantially all of their salt from International.

Since these three early cases the Supreme Court has incrementally expanded the application of the compulsory licensing decree to the limits defined in *Glaxo*, where-

[44] 332 U.S. 392 (1947).

in the Court in effect substantiated what many commentators had been saying for years—that such decree provisions have become a standard and firmly established form of relief in antitrust cases involving patents.[45]

For example, in *United States* v. *United States Gypsum Co.*[46] the Court set forth the reasoning that should be used in such a case:

> A trial court upon a finding of a conspiracy in restraint of trade and a monopoly has the duty to compel action by the conspirators that will, so far as practicable, cure the ill effects of the illegal conduct, and assure the public freedom from its continuance. Such action is not limited to prohibition of the proven means by which the evil was accomplished, but *may range broadly through practices connected with acts actually found to be illegal.*[47]

A further extension was later effected in *United States* v. *United Shoe Machinery Co.*[48] In that case the defendant held nearly 4,000 patents and supplied more than seventy-five percent of the shoe machinery manufactured in the United States. The antitrust violation included a business scheme which virtually locked the defendant's lessees to him and thereby created an entry barrier for potential newcomers in the field. There existed no abusive or illegal patent practices. Yet, the Court, in an attempt to reduce the defendant's monopoly power, required the defendant, *inter alia,* to license his patents on a reasonable royalty basis. This holding is therefore very important in terms of precedence for the Court's decision in the *Glaxo* case, in which there also was no specific patent abuses except that the patents allegedly helped contribute to the success of the larger overall business scheme which resulted in an antitrust violation.

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[45] See, for example, Frost, footnote 36, *supra,* at 127, and Comment, *Compulsory Licensing of Patents by the Federal Trade Commission,* N.W. L.R. 543 (1964).

[46] 340 U.S. 76 (1950) (explained in United States Gypsum Co. v. National Gypsum Co., 352 U.S. 457 (1957)).

[47] 340 U.S. at 88-89. [Emphasis added].

[48] 110 F. Supp. 295 (D. Mass. 1953), *aff'd.* per curiam, 347 U.S. 521 (1954). For a case after *Gypsum* but before *United Shoe* see Besser Mfg. Co. v. United States, 343 U.S. 444 (1952).

IV. Glaxo—the Ratio Descendi

A. Governmental Patent Challenges

In a somewhat succinct and deliberate manner, the Supreme Court in the *Glaxo* case recognized the Government's inherent ability to challenge the validity of any patent involved in an antitrust suit. Although the Court seemingly reached its ultimate conclusion with little trouble, which undoubtedly resulted in part from the absence of any *stare decisis* problem, it should not be assumed that the Court encountered no problems in developing its decision. The real challenge for the Court, the selection of the proper vehicle for reaching its ultimate conclusion, was settled behind the scenes in gentlemanly fashion. Just as Section 4 of the Sherman Act had earlier become the vehicle for establishing compulsory licensing, compulsory licensing, in conjunction with the public policy favoring the invalidation of specious patents, has now in turn taken its place as a vehicle for governmental patent challenges.

After formulating the "major issue", i.e. whether the Government can challenge the validity of a patent in the course of prosecuting an antitrust violation only when the patent is relied upon as a defense, the Court sets forth two justifications for answering this inquiry negatively. The first of those justifications involves the strong underlying public policy which disfavors invalid patents. In developing this point, the Court initially pays passing tribute to its own pronouncement in *United States* v. *Bell Telephone Co.*,[49] wherein the Court established the Government's ability to bring suit to set aside a patent on the basis of fraud having been committed on the Patent Office, but its inability to bring such suit on the "mere ground of error in judgment on the part of the patent officials. . . ."[50] In order to qualify such a pronouncement the Court quickly notes that the *Gypsum* case established a power in the Government "to

[49] 167 U.S. 224 (1897).
[50] Id. at 269.

attack the validity of patents relied upon to justify anti-competitive conduct otherwise violative of the law."[51] Of course, that holding alone is insufficient to support the ultimate conclusion in this case; therefore the Court next examines the underlying justification for the *Gypsum* ruling and finds such to be a recurrent theme in patent-antitrust cases—that the public interest requires free competition. For specific examples, the Court points to the line of cases which followed this theme to arrive at the conclusion that a "private licensee-plaintiff in an antitrust suit may attack the validity of the patent under which he is licensed even though he has agreed not to do so. . . ."[52] Furthermore, the Court points to other cases, for example the recent case of *Lear* v. *Adkins*[53] which abrogated the patent doctrine of licensee-estoppel, to further emphasize the public desire for having worthless patents removed as impediments to free competition.

Having laid this groundwork, the Court then concludes that such a public policy "is sufficient authority for permitting the Government to raise and litigate the validity of the ICI-Glaxo patents in *this* antitrust case."[54] However, the Court does not merely rely upon this public policy justification without adding some qualification. To have done otherwise would have drastically overstated the Court's position, primarily because such a bare, unqualified reliance would have been sufficient to justify a Governmental challenge to *any* patent. In regard to the Court's qualification, it must first be noted that the Court says "this" case within the portion of its conclusion quoted in the earlier portions of this paragraph. Then the Court apparently points out the reason that such a challenge is permissible in "this" case—the appellees had licensed their *patents* in such a manner as to *per se* unreasonably restrain trade. Such a conclusion is an implied rejection of the argument advanced

[51] 410 U. S. at ....., 176 USPQ at 291.
[52] Id.
[53] 395 U.S. 653 (1969).
[54] 410 U.S. at ....., 176 USPQ at 291 [Emphasis added].

by appellee ICI that its resale restrictions constituting the antitrust violations should be considered separate and apart from its patent licenses.[55] Thus, the ultimate effect of this portion of the Court's opinion is that a patent included within a larger licensing scheme, a portion of which offends the antitrust laws, may be challenged by the Government even though that patent is not asserted by the licensee in an attempt to justify the anticompetitive portions of his license agreement as being reasonably ancillary to the Constitutionally sanctioned reward for his inventive efforts.

The second justification set forth for the Government's ability to challenge the patents of ICI and Glaxo has even greater significance for a couple of reasons: first, the Government had not advanced this position in any of its Briefs, which therefore indicates the Court's inclination to authorize governmental challenges; and second, this justification, although primarily offered to bolster the Court's holding in the instant case, inherently opens a completely new and indefinitely defined avenue for patent challenges.

The foundation of this second justification is simply that mandatory sales and reasonable-royalty licensing, the relief requested by the Government in the *Glaxo* case, are "well established forms of relief when necessary to an effective remedy. . . ." [56] With this foundation in mind, the Court then apparently deduces that such forms of relief are on the same plane as a patent validity question, since both involve the future enforceability of the patent. The test that the Court then sets forth is that:

> it would have been appropriate, if it appeared that the Government's claims for further relief were *substantial,* for the [district] court to have entertained the Government's challenge to the validity of those patents.[57]

Later in the decision the Court deals with what constitutes a "substantial" case to justify attacking the va-

[55] See Brief of ICI, pp. 19-21.
[56] 410 U.S. at ....., 176 USPQ at 291.
[57] Id. [Emphasis added].

lidity of patents, but only after it makes it quite clear that this decision does not stand for wholesale and unlimited patent challenges:

> we do not recognize unlimited authority in the Government to attack a patent by basing an antitrust claim on the simple assertion that the patent is invalid. . . . Nor do we invest the Attorney General with a roving commission to question the validity of any patent lurking in the background of an antitrust case.[58]

Having offered this bit of cautioning language, the Court then further attempts to justify the broad powers that have been conferred upon the Government and district courts:

> But the district courts have jurisdiction to entertain and decide antitrust suits brought by the Government and, where a violation is found, to fashion effective relief. This often involves a substantial question as to whether it is necessary to limit the bundle of rights normally vested in the owner of a patent, which in itself can be a complex and difficult issue.[59]

After concluding that the district court had erred in refusing to even consider the question of the validity of the patents at issue, the Court then returns to its involvement with what constitutes a "substantial" case for further relief to justify examining the validity of a patent. But instead of giving definitive guidance regarding the manner in which this newly devised vehicle for patent attacks should be applied in the future, the Court merely states that the Government's case "need not be conclusive but only substantial enough to warrant the court undertaking what could be a large inquiry, but one which could easily obviate other questions of remedy if the patent is found invalid. . . ."[60] Thus, the Court is apparently telling the district courts that the approach to take when confronted with the situation of a governmental patent challenge in an antitrust suit is, at some time in the early stages of the trial, to balance the gravity and showing of the alleged antitrust

[58] Id.
[59] Id.
[60] 410 U.S. at ....., 176 USPQ at 292.

violation, on the one hand, against the amount of time which might be expected to be expended on the question of patent validity, on the other hand.

B. Compulsory Patent Licenses

The Court leaves its discussion of what constitutes a "substantial" case by concluding that the Government had done more in this case—it had presented a "sufficiently convincing" showing which, wholly aside from the question of patent validity, compelled the district court to decree mandatory sales and compulsory licensing. For justification of this conclusion the Court points to two primary situations in the particular factual setting. First, the Court discusses the manner in which the patents in question gave appellees the "economic leverage" to enforce the antitrust violations. The primary focus of this discussion relates to the interlocking features of the ICI and Glaxo patents. The Court considers those features in this particular factual setting to enable the appellees to not only control the patented drugs and processes, but also to control the unpatented form of the drug and to effectuate the conduct constituting the *per se* restraint of trade.

The second fact that the Court points to is the structure of the United States griseofulvin market, which "consists of three wholesalers, all licensees of appellees, that account for 100% of United States sales totaling approximately eight million dollars." [61] With such a market condition existing, allegedly because of the defendants' unlawful licensing scheme, the Court finds it necessary to "pry open the competition" the griseofulvin market by requiring compulsory sales and patent licensing. But the Court does not simply stop here with its analysis; it then elaborates on the range of possible actions which the appellees *might* take to maintain a monopolistic-like market structure if some remedy less severe than compulsory sales and licensing were to be imposed. With no evidence having been adduced to sug-

[61] Id.

gest that the appellees would resort to any of the activities suggested by the Court, it seems fair to conclude that the Court thinks that once someone has committed one antitrust violation he will go to any extreme to maintain his illegally acquired fruits.

Thus, the Court has made two things quite clear. First, the lower Court was in error for trying to apply the earlier Supreme Court compulsory licensing cases[62] literally by limiting those holdings to their particular facts. And, second, mandatory sales and patent licensing are indeed standard and well-established forms of antitrust relief not to be applied in a sparing manner. The significance of this result, however, is not merely limited to authorizing a wider spread use of these remedies. It should be recalled from the earlier portions of this article that the courts, in determining whether or not to entertain the issue of patent validity, must determine whether the Government has presented a "substantial" case for further relief. With such relief apparently now being more easily attained, it would appear that less of a showing need be made by the Government that such relief is in order. Therefore, since that magical "substantial" case plateau appears to be set at a somewhat low level, patent validity challenges may necessarily become the order of the day.

V. Inadequacies of the Court's Decision

While it is clear that the Court did not wish to recognize an unlimited authority in the Government to challenge the validity of patents [63] or to invest the Attorney General with a "roving commission" to attack the validity of patents associated in some slight degree with an

[62] See the discussion, *supra*, at pages 485-490.

[63] The Court's refusal to recognize such an unlimited authority probably results from two major factors. First, the Government did not argue before the Supreme Court that it has such power, as it so argued in the lower court. Rather, the Government limited its argument to the proposition that it has the inherent power to challenge the validity of patents "involved" in an antitrust action. See Brief of the United States, pages 21 *et seq.* Second, the Court undoubtedly subconsciously recalled that Congress had on several occasions considered to some extent such a power but had never established such. See footnote 28, *supra*, and the accompanying text.

antitrust case, it is likewise clear that the Government has been endowed with a greater ability to challenge patents than ever before. The Court's failure to provide definitive and stringent guidelines for future exercise of this greater ability is probably the greatest, but not the only, shortcoming in the opinion.

To begin with, the Court made a glaring error in its conclusion that the lower court had found the *sale* restrictions to be in *per se* violation of the Sherman Act. As noted previously,[64] this error probably had no influence in the outcome of the decision, but it is most unfortunate that the reasoning behind the decision of such an important case be tainted. It is also unfortunate that the Court even intimated that such practices are antitrust violations without having thoroughly reviewed the issue. Undoubtedly, some future litigant will point a finger to the Court's rather loose language in this matter, with the forum possibly being influenced thereby in its "pristine" analysis of the issue.

A not-so apparent shortcoming in the opinion is its failure to distinguish between the particular types of patent challenges which may be asserted by the Government. This failure to do so, set against the background of the particular facts, therefore means that the Justice Department is able to assert any type of patent challenge, even if it is a patent policy consideration which has been decided by the administrative expert in the field, the Patent Office. To be more precise, in the lower court the Government challenged the patents specifically at issue not on the grounds that they were invalid for being anticipated[65] by or obvious[66] over prior art of which the Patent Office was unaware, or that fraud had been committed on the Patent Office, but on grounds which were purely policy considerations. To be even more precise, the Government challenged the Glaxo "microsize" patent and the composition-of-matter claims in the

[64] See the discussion in footnote 6, *supra*.
[65] See 35 U.S.C. sec. 102 (1958).
[66] See 35 U.S.C. sec. 103 (1958).

ICI patent [67] on the ground that such claims were drawn to a composition of matter previously known in the art and therefore invalid as being anticipated under 35 U.S.C. sec. 102. Furthermore, the Government asserted that when a new use for an old compound is discovered, such an invention must be claimed as a process under 35 U.S.C. sec. 100(b) rather than as a product in the manner accomplished by Glaxo and ICI, i.e. claiming griseofulvin in combination with a filler *in a particular dosage form.* In fact, at one point in its Brief before the Supreme Court the Government was even so bold as to categorically state that there "is no question that the appellees' patents could be invalidated in private litigation."[68]

On the other side of the picture is the position taken by the Patent Office in this matter. By allowing the claims in the Glaxo and ICI patents, the Patent Office was inherently taking the position that these particular types of claims are patentable if they meet the statutory requirements, primarily 35 U.S.C. sections 102, 103 and 112. Furthermore, by allowing the product-type claims, the Patent Office took the position that such claims are to be judged by 35 U.S.C. sec. 103, rather than sections 102 or 100(b) as suggested by the Justice Department. Such a position seems wholly appropriate, since that statutory section deals with claims involving differences between the prior art and the invention sought to be patented. That is exactly the situation of the product-type claims in the appellees' patents. Even though griseofulvin was known as an antifungal agent, the prior art did not disclose combining it with a carrier and forming it into a tablet dosage form or a microsize form for internal consumption. In fact, the case law in this area supports the Patent Office position. For example, *In re Pieroh and Werres* [69] points out that:

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[67] See footnotes 2 and 3, *supra.*

[68] See Brief for the United States, page 30.

[69] 319 F.2d 248, 251, 138 USPQ 238, 241 (CCPA 1963). See also the same conclusion in In re Wiggins, 397 F.2d 356, 158 USPQ 199 (CCPA 1968).

very slight changes may be responsible for imparting new properties to the "old compound" and such changes may create a patentable new "composition of matter." It is not sufficient to support such a rejection to rely upon some "rule" which asserts that a known compound "cannot be made patentable merely by adding thereto conventional adjuvants or carriers" as here urged by the solicitor. Each situation must be analyzed in the light of the particular facts disclosed in the record.

Therefore, the effect of the two inconsistent positions taken by the Patent Office and the Justice Department is an extension of the competition between these two agencies as to who should enjoy the status of "ultimate arbiter" in patent policy considerations. Off hand, one would think that the agency established by Congress to exclusively deal with the topic of patents should enjoy that status. However, the Court's failure to distinguish between the permissible types of patent challenges which can be asserted by the Justice Department lends support for an argument that Justice enjoys a position which is at least comparable to that of the Patent Office in patent policy matters. The Court's statement in the *Bell* III case that the Justice Department cannot challenge "a patent for invention on the mere ground of error of judgment on the part of the patent officials" is indeed in a state of erosion.

Another inadequacy in the Court's opinion is its failure to explain or justify the permissibility of attacks to the particular patents at issue, especially the recently issued [70] Glaxo microsize patent. Under the first justification for patent challenges, i.e. that the strong public policy favoring invalidation of specious patents enabled the Government to attack the patents in "this" suit, the Court impliedly seems to be taking the position that any patent which becomes subject to the conditions of an anticompetitive licensing agreement is open to challenge the Government, regardless of the length of time it has been subject thereto. Taking this situation to its farthest extreme, a patent which issues on a particular day is

[70] This patent was issued July 11, 1967, only eight months before this suit was initiated.

on that day subject to attack by the Government if it becomes subject to a licensing agreement which contains an anticompetitive feature. Such a result seems somewhat inequitable simply because that patent, at that time, could not possibly have contributed to the illegal aspects of the licensing—or put another way, the illegal licensing aspects could not possibly have permeated the patent to give it an illicit character.

The Court, likewise, fails to offer guidelines as to what patents may be attacked under its second justification, i.e., that a court hearing an antitrust case may entertain a question of patent validity if the Government presents a "substantial" case for further relief in the form of limiting the future enforceability of the patents at issue. Aside from the Court's failure to adequately define what constitutes a "substantial" case, the Court further failed to specify which patents at issue could be attacked by the Government under this authority. Again, the recently issued "microsize" patent could not have contributed to the overall illegal scheme as suggested by the Court, simply because during the short duration of its existence it could not feasibly have (1) provided the economic leverage to enforce the eight-year old resale scheme nor (2) contributed to the monopolistic-like market structure which already existed when it issued.

The final inadequacy of the opinion concerns the lack of any discussion regarding the Government's ability to challenge the validity of a patent when the antitrust count forming the basis of the suit fails. Under the discussion of the first justification the Court simply states that the licensing agreements constituting the restraints of trade were set forth in the complaint and then found by the lower court to be in *per se* violation of the Act. Thus, the Court is not faced with the issue of the antitrust count failing, and, apparently, never considers the problem.

It would seem somewhat inequitable to permit the Government to simply allege, without proving, an antitrust violation in order to challenge the validity of a patent

included within the particular licensing agreement under attack. Such a result would appear to give the Government an unlimited authority to challenge the validity of patents, something which the Court says it is unwilling to grant. On the other hand, when an antitrust defendant asserts his patent as a shield for allegedly anticompetitive covenants, the Government need not first prove the antitrust violation before it can attack the validity of the patent. However, this situation is clearly distinguishable from the type of patent challenge now authorized under *Glaxo,* since in that former situation the invalidity of the patent must first be demonstrated in order to take the covenants under challenge—which are probably clearly anticompetitive, or else the defendant would have never asserted the patent shield—out from under the protective realm of a patent grant. This point will undoubtedly be endlessly speculated upon by proponents and opponents of this decision until an authoritative word on the subject has been espoused.

Under the discussion of the second justification for patent challenges, the Court also fails to face the situation where the Government might initially allege a need for compulsory licensing and then fail to present a sufficiently convincing showing that such relief is in order. As previously discussed, the Government will presumably attempt to prove its "substantial" case at some point in the early stages of the trial. If the court at that point decides to entertain the challenge to the validity of the patents at issue, then declares one of those patents to be invalid, then decides, after all the evidence has been adduced, that compulsory licensing of the other patents under consideration is improper, it would seem somewhat paradoxical for the court then to conclude that it did not have the ability to entertain the question of patent validity. It would therefore seem that once the court has made its decision on the "substantial" case question, there is no turning back in terms of the consideration to the validity of the patent. It would also seem that once a court has decided that a

"substantial" case has been presented, that court would be unlikely to later place itself in the awkward position of concluding that compulsory licensing is improper in that case, even though it might well be clearly improper. Thus, it is apparent that a vicious cycle is put into motion once the validity of a patent is challenged under the authority that compulsory licensing may be in order. Therefore, in order to eliminate these problems it is compelling for district courts to escalate that magical "substantial" case plateau so that it very nearly approaches the proof needed to actually justify any additional form of relief tantamount to compulsory licensing.

VI. Conclusion

With so many questions regarding the extent of the *Glaxo* holding having been unanswered, much litigation will surely result in the near future because of attempts to nail down definite limits on the Government's ability to challenge the validity of patents. But during this chaotic period in the courts, it should not be forgotten that *Glaxo* may have been set out as a stepping stone for the Court to later conclude, whenever the question presents itself, that the Justice Department has unfettered ability to challenge the validity of any patent for any reason. Such a later step by the Court would come as a great disappointment to those intimately involved with the patent portion of the patent-antitrust conflict, but would not come as any great surprise to anyone. For as Justice Rehnquist stated in his dissenting opinion in *Glaxo,* the Justice Department does indeed enjoy "an impressive batting average in the Court as an antitrust litigant. . . ."

James F. Davis **

PATENT LICENSES UNDER GOVERNMENT CONTRACTS: NEW JUDICIAL SCRUTINY *

Introduction

Patent license rights under government contracts are a matter of concern to anyone who does business with the federal government. And today, that includes much of American industry. As most of you know, government patent policy has been, and continues to be, the subject of lively debate. Each administration grapples anew with the problems, and we see issued from time to time administration policy statements, Congressional pronouncements and agency regulations, all designed to reconcile the interests of private business and the government in publicly-financed innovation.

I would like to focus on one aspect of government patent policy: the changing judicial climate in which government patent license problems are resolved. The U. S. Court of Claims is the federal court most active in government patent license matters. It is therefore appropriate that we look to and analyze that court's decisions. I will take an historical approach to the subject since I think that is the best way to highlight the evolution of the court's attitudes.

The Early Law (World War I Era)

As our point of departure, we go back to the days of World War I. It was during World War I that federal government contracting and procurement started in a big way, particularly contracting which involved research and development. Few, if any, government contracts in those days contained patent rights clauses.

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What usually happened was that any patentable inventions made during the performance of a government contract remained the sole property of the contractor to exploit as he saw fit. There were seldom any express or implied understandings about what rights the government got under patentable inventions.

In 1929, the Court of Claims decided its first government patent license case. The case was *Ordinance Engineering Co.* v. *United States*.[1] In that case Ordinance Engineering Co. entered into a contract with the government to develop and manufacture artillery shells. The contract was a sort of combined supply, and research and development, contract. During the course of the contract's performance, Ordinance Engineering made several inventions which it ultimately patented. Later, the government procured infringing shells from an unlicensed source and Ordinance sued for infringement.

The government argued that since it had provided funds for research and development leading up to the making and patenting of the inventions, it was entitled to an implied license under the patents. The Court agreed and in its opinion made the following statement which is still cited in cases dealing with government contract patent licensing:

> Except for the development processes carried on at the expense of the government, under its supervision and with its suggestions in collaboration and contractual relationship with the plaintiff, these patents would not have come into existence. We need not multiply the citation of authorities to sustain the rule that where one is employed by another for development and experimental work the result of the relationship is an implied license to the employer to use whatever invention develops from the experiment.

Post-World War I Era

Between World War I and World War II, few problems of government patent licensing reached the courts, no doubt because government procurement, and in particular

[1] 68 Ct. Cl. 301 (1929).

research and development, was minimal. However, the principle set out in the *Ordinance Engineering* case continued and is reflected in the *Breese Burner Company*[2] case, decided by the Court of Claims in 1957. The *Breese Burner* case, though decided in 1957, deals with facts going back to the early 1940's.

In the *Breese Burner* case, the Army asked the Breese Burner Company to develop a conversion unit for converting wood-burning stoves to oil-burning stoves. No formal contract was entered and the Army provided no funds for the development, but there was an implied understanding that if Breese succeeded in developing a conversion unit, the Army would procure them from Breese. Breese in fact developed a satisfactory unit, which it patented. Breese then sold many of the units to the Army.

Later, the Army procured infringing units from an unlicensed source, and Breese brought suit in the Court of Claims. The government argued that it had a "general license" under the patent by virtue of its earlier procurement from Breese. The Court held however, that the government had no "general license." The Court followed the rationale of the *Ordinance Engineering* case, i.e., since the government contributed no funds to the development of the invention it got no rights under the patent. There seems little doubt that if the Army had contributed funds, or significant manpower or material, to the development work, it would have gotten an implied license consistent with the principles of *Ordinance Engineering.*

In short, then, the *Ordinance Engineering* and *Breese Burner* cases represent the court's early approach to government patent license problems, an approach which was equitable in nature and did not turn on specific contractural obligations.

World War II Era

We now come in our historical development to World War II. World War II signalled the beginning of the

[2] 140 Ct. Cl. 9, 115 USPQ 179 (1957).

government's heavy involvement in research and development, as well as procurement. And with that involvement came a new and sophisticated approach to government contracting. No longer were patent rights left unmentioned in government contracts. Patent rights clauses began to appear in both supply contracts and research and development contracts.

Though the clauses varied in detail from contract to contract, and among different contracting agencies, patent rights clauses typically provided that the government got a royalty-free license to practice what were called "Subject Inventions." Generally, "Subject Inventions" were defined as any inventions "conceived or first actually reduced to practice during the performance of the contract." Thus, from the beginning patent rights clauses have been couched in the language of the patent law. "Conceived" and "actually reduced to practice" are terms of art, and the legislative history of patent rights clauses shows that it was intended that patent law principles be used in construing and applying the clauses.

In the aftermath of World War II and the Korean War, a host of patent license cases came to the Court of Claims. The cases usually required interpretation of patent license clauses. For the most part, the court resolved the issues on the basis of well-established principles of patent and contract law. Illustrative cases are *Erie Resistor Co.*,[3] *Tripp*,[4] and *Eastern Rotorcraft.*[5]

I will discuss those cases briefly since they illustrate the court's approach to the problems and set the stage for some dramatic later developments.

In the *Erie Resistor* case, the government entered a supply contract with Erie Resistor Company during World War II to make capacitors in accordance with a government specification. The government furnished funds to Erie Resistor to expand its plant facilities and to do test work in furtherance of performing the contract.

[3] 150 Ct. Cl. 490, 279 F.2d 231, 125 USPQ 658 (1960).
[4] 186 Ct. Cl. 872, 406 F.2d 1066, 161 USPQ 115 (1968).
[5] 181 Ct. Cl. 299, 384, F.2d 429, 155, USPQ 729 (1967).

The capacitors were constructed using a chemical compound called barium titanate as insulating material. Barium titanate was well-known in the art as an insulating material.

During the time the supply contract was being performed, a Mr. Gray at Erie was doing research and development work on the physical properties of barium titanate. He found that it had piezoelectric properties and could be used to make transducers. Gray got a patent on transducers having barium titanate as an essential component.

Later, the government procured transducers containing barium titanate from a source not licensed under the Gray patent and Erie brought suit.

The government argued that it was licensed under the Gray patent because the R & D work done by Gray was performed contemporaneously with the supply contract and was within the scope of test work performed under the supply contract. The Court, however, held that the government got no license. The Court said that the funds supplied to Erie for plant expansion and test work under the supply contract did not embrace research and development on the physical properties of the barium titanate. Gray's findings and his invention of the barium titanate-containing transducer were not related to performance of the supply contract. Therefore, there was found to be no logical or rational connection between government funds and the development of Gray's invention.

In the *Tripp* case, Tripp invented an improved airplane hangar and got a patent on it. At the time he made the invention, Tripp was employed by Luria Engineering Company. Tripp was a management employee of Luria, rather than an engineer working on research and development, and Tripp was not required by Luria to assign the patent to Luria.

At the time Tripp made the invention, Luria had two contracts with the government relating to the building of aircraft hangars and maintenance facilities. One of

the contracts had a typical patent rights clause which, among other things, required the licensing to the government of inventions made by "technical personnel" of Luria. The other contract had no express patent rights clause but required that the government have access to, and royalty-free use of, any "technical data" developed during the performance of the contract.

Tripp sued the government in the Court of Claims when the government procured infringing airplane hangars. In the Court of Claims, the government contended that it had an implied license under the Tripp patent by virtue of one or both of its contracts with Luria.

The Court did not agree. It held that the government was licensed under neither contract. With respect to the first contract, Tripp was held not to be "technical personnel" within the meaning of the contract. The Court held that Tripp was not an engineer doing development work; that he had not been hired to make inventions; and that he had in fact made the invention on his own. Luria got at most a shop right under the patent, but it had no obligation to grant further licenses.

With respect to the second contract, the Court held that it called only for granting to the government of the right to use "technical data" and did not expressly include rights under patents. Tripp's invention was held not to be embraced by the term "technical data."

The *Tripp* case therefore represents the Court's approach of looking closely at contract language to determine the rights of the parties.

In the *Eastern Rotorcraft* case, the government was interested in procuring cargo nets which Eastern Rotorcraft was developing and on which Eastern Rotorcraft later got a dominant patent. Eastern Rotorcraft demonstrated the nets to the Air Force. The Air Force liked what it saw and entered into a contract for procurement. The contract contained typical patent license language and said that the government was entitled to rights under any invention "conceived or first actually reduced to

practice in the performance of the contract." The contract also said that the government was not entitled "by implication or otherwise" to inventions other than those made under the contract.

During performance of the contract, Eastern Rotorcraft made an improvement invention on the cargo net which earlier had been demonstrated to the government, and Eastern Rotorcraft got a patent on the improvement. The improvement patent was licensed to the government pursuant to the contract requirement. However, Eastern Rotorcraft never licensed the dominant patent to the government.

In a suit in the Court of Claims on the dominant patent, the government contended that it got an implied license under the dominant patent since its license under the improvement patent was useless without a license under the dominant patent. The Court, however, held otherwise, stating that the contract expressly provided that there were to be no implied licenses under other inventions, and that "other inventions" included the dominant patent.

In sum, the *Erie Resistor* case, the *Tripps* case and the *Eastern Rotorcraft* case all represent situations where the court looked closely at the contract language and stuck closely to a literal interpretation of the language.

The 1960's and the Mine Safety Case

Up to the mid-1960's, the law was developing so as to make reasonably predictable the interpretation of patent rights clauses. Then, in 1966, there came a thunderbolt known as the *Mine Safety* [6] case. Mine Safety represents what many view to be the dawn of a new era of interpreting government patent license clauses. And cases since *Mine Safety* appear to support that view.

The facts in *Mine Safety* briefly were as follows: The University of Southern California and the Navy entered into a research contract in 1946 under which the Univer-

[6] 176 Ct. Cl. 777, 364 F.2d 385, 150 USPQ 453 (1966).

sity was to do studies on the physiological, biochemical and anatomical effects of acceleration on the human body. The University was to use a "human centrifuge" to do the study. The Navy provided funds for a building and for equipment to do the research. The contract was worked on by two engineers, Lombard and Roth.

At about the same time in 1946, the University started work on a crash helmet project which was supported by private funds from the Aircraft Industries Association. Lombard and Roth each worked on both the Navy contract and the crash helmet project. The crash helmet project was done in a separate building and with equipment separate from the Navy work, and the University maintained separate accounts and records so as to keep the projects independent of one another.

The crash helmet project resulted in a patent on which the government was later sued.

In the Court of Claims, the government contended that it had a license under the patent because the crash helmet project was embraced within the scope of research work under the Navy contract. There was no question but that the Navy contract did not expressly call for development of crash helmets or any other hardware, and in fact the Navy had refused requests by the University to help fund the crash helmet project.

The trial Commissioner of the Court of Claims held that the government was not licensed, but that the patent was, in any event, invalid. On appeal, the full Court of Claims held that the government was licensed and the court did not reach the question of patent validity. One judge concurred in the result, but rejected the government's license argument saying that it was "difficult to resolve in favor of the government."

The remarkable thing about the *Mine Safety* case is that a majority of the court went out of its way to develop the license issue when it could have disposed of the case simply on the basis of patent invalidity. This has led some to believe that the case signalled a new approach to government patent license questions.

What the court did in *Mine Safety* was essentially two things:

(a) First, it broadened the definition of "Subject Invention" by holding that an invention which is "umbilically connected" to government-funded research is a "Subject Invention" and must be licensed to the government. The Court did so on the basis of what it called a "liberal" reading of the patent license clause. The Court pointed to the old *Ordinance Engineering* case as support for what it considered to be an equitable approach to the problem; and

(b) Second, the Court broadened the concept of "in the performance of the contract" to mean that if an "important factor in the invention" flowed from work done in "performance of the contract", then a license was appropriate. The Court relied heavily upon the circumstances that the crash helmet was developed through what the Court felt was knowledge and experience gained under the Navy contract. And the Court also relied upon the fact that one of the engineers (Lombard) was paid from Navy funds while he worked on both projects.

Some believed that the *Mine Safety* case did not represent a fundamental change in the court's dealing with government patent license problems. However, subsequent events showed otherwise. The *AMP*[7] case, decided two years later, was dramatic proof that, indeed, the Court was changing its approach.

In the *AMP* case, AMP entered into a research and development contract with the government to develop a wire splicing tool. The contract provided the usual patent rights clause and also said that the government got a license under background patents either owned by AMP at the time the contract was entered or acquired by AMP before the contract was completed. However, the government got no license under background patents acquired after the completion of the contract.

[7] 182 Ct. Cl. 86, 389 F.2d 448, 156 USPQ 647 *cert. denied*, 391 U.S. 964 (1968).

AMP made and patented an invention (a wire splicing tool) during performance of the contract and granted a license to the government. After the contract was completed, AMP found out about a dominant background patent which would have precluded commercial (i.e., non-government) exploitation of the new wire splicing tool. AMP therefore purchased the dominant patent. Later, AMP sued the government on the dominant patent when the government procured the AMP splicing tool from an unlicensed source.

The trial commissioner held that the contract expressly excluded a license under the after-acquired dominant patent, and that in making its bargain with the government, AMP reserved whatever rights it might later acquire in dominant patents. On appeal, the full court felt otherwise. It held that the government got a license by implication under the after-acquired dominant patent. The Court said that "Subject Invention" in the contract's patent license clause embraced the specific splicing tool developed by AMP whether or not patented and irrespective of the number of patents which might cover it and irrespective of when those patents were acquired. In the Court's view, once the government was granted a license to make a specific device or use a specific "idea", it could continue to make that device or use that "idea" even though the patentee later acquired another patent which dominated the device or "idea."

The *AMP* case caused a furor in the patent bar since it appeared to ignore the terms of the contract as well as traditional patent law concepts. A writ of certiorari was sought but was denied. Since the reasoning in the *AMP* case cannot be squared with earlier cases, particularly the *Eastern Rotorcraft* case, one can only conclude that the Court has done an about face on questions of implied licenses under background patents. What the *AMP* case means as a practical matter is that if contractors want to protect their rights under background patents, they must do so by language which expressly identifies the background patents and excludes them from the license grant, or at least the contract must include

express language which says that no rights are granted under after-acquired background patents irrespective of any rights granted under "Subject Inventions." Whether the government would accept such contract language is, in the final analysis, a matter of negotiation.

Post-Mine Safety Cases

In the wake of the *Mine Safety* and *AMP* cases, the result in the *Technitrol*[8] case should not have been too surprising. *Technitrol* involved a complicated fact situation in the computer art, and I will not try to develop it in great detail. In essence, the situation was much like *Mine Safety*. The University of Pennsylvania had simultaneous contracts with the government and with the Technitrol Company to develop computer hardware. Out of the development work for the government came several patents, one of which was the now famous ENIAC patent (recently held invalid by the Minnesota District Court) and another of which was the EDVAC patent. The EDVAC was a second-generation computer to the ENIAC. Out of the work under Technitrol funds came a patent on the first computerized airline reservation system, which broadly speaking, is an inventory control system.

The two lines of development work (i.e., on the government computers and on the Technitrol computer) involved some common problems, and there is no doubt that work on the two projects cross-fertilized one another. The patent claims to the Technitrol system recited some elements which the court felt were developed under the government contract. Accordingly, the Court held that the government was licensed to use the Technitrol system insofar as its elements were common to the developments under the government contract. Therefore, the court held that any compensation paid under the Technitrol system patent must be tied specifically to elements developed solely under the Technitrol-funded work. If it were not possible as a practical matter to separate

[8] 194 Ct. Cl. 596, 440 F.2d 1362, 169 USPQ 732 (1971).

out those elements for determining a reasonable basis for compensation, then no compensation should be paid. The *Technitrol* case was later settled, so we will never know just how the court would have gone about determining the compensation question.

Finally, I will mention the *Technical Development*[9] case which is a Court of Claims Commissioner's decision now up on appeal to the full court.[10] The *Technical Development* case adds a new wrinkle to the ever-broadening liberality with which government contract patent matters are being resolved. *Technical Development* held that an independent inventor and the corporation he owns were bound by the patent rights clause of a government R & D contract with a third party even though the inventor and the corporation were not express parties to the contract. The case turned on the fact that the inventor and his corporation received funds under the contract through the third party and these funds were used in making the invention. Under the circumstances, inventor and the third-party contractor were held to be "joint venturers" and thus both were bound by the contract's patent rights clause. The case harkens back to the principle of the *Ordinance Engineering* case that if government funds are used to make an invention, then the government gets at least a royalty-free license.

Thus, with the *Mine Safety, Technitrol* and *Technical Development* cases, we have come nearly full circle back to *Ordinance Engineering,* and as the French say "the more things change, the more they stay the same."

That concludes my remarks except to note a statement in a recent decision of the Armed Services Board of Contract Appeals (*American Nucleonics Corporation* ASBCA No. 15370, decided April 17, 1973). In discussing the judicial interpretation of patent rights clauses, the Board notes the *Mine Safety* and *Technitrol* cases and says:

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[9] 171 USPQ 353 (Ct. Cl. Commr. 1971).

[10] On June 20, 1973, the full court affirmed *per curiam* the Trial Commissioner's decision, ... Ct. Cl. ....., ... F.2d ....., ... USPQ ..... (1973).

The cited Court of Claims cases show that the government's entitlement to a royalty-free license is not dependent on the invention having been conceived or finally reduced to practice in the course of performance of the government contract containing the patent rights clause, if there was a 'close and umbilical connection' between the invention and the government-financed research work.

That, I submit, is the final act of closing the circle. The Board simply strikes the patent rights clause out of the contract and goes back to *Ordinance Engineering*.

Harold S. Meyer *

"OBVIOUS" DIFFERENCES - WHAT SHOULD THE POINTS OF REFERENCE BE?

The sharply divided recent opinion of the judges of the Court of Customs and Patent Appeals in *In re Hellsund* 177 USPQ 170 and in *In re Bass, Jenkins, and Horvat* 177 USPQ 178, both decided March 15, 1973, bring up again the controversy as to the meaning of 35 USC 103 and its relation to 35 USC 102—that is, the question of the exact meaning of "prior art" in § 103.

The opinions in both cases are by the same four judges of the Court, joined in one case (Hellsund) by Judge Rao of the Customs Court and in the other case (Bass et al.) by Judge Rosenstein of the Customs Court, both sitting by designation.

The decisions in both cases are unanimous. In *Hellsund* the Court unanimously *affirmed* the decision of the Board of Appeals rejecting the claims. In *Bass et al.* the Court unanimously *affirmed* the decision of the Board rejecting claims 2 to 5 and unanimously *reversed* the rejection of claims 1 and 6 to 9.

The four judges of the Court of Customs and Patent Appeals split evenly as to the reasons for the decisions, neither pair being willing to accept the reasoning of the other. Accordingly, the temporarily assigned judges cast the deciding vote in each instance, Judge Rao in *Hellsund* voting with Judges Almond and Baldwin, and Judge Rosenstein in *Bass et al.* voting with Judges Rich and Lane.

The issues in each case included the extent to which "prior invention" by another could be used as a point of reference from which obviousness could be found present or absent under § 103. In other words, is it proper in determining whether a claimed invention would have been "obvious" under § 103 to measure the differences

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from an earlier "invention made in this country by another who had not abandoned, suppressed, or concealed it" as recited in § 102(g)?

One protagonist, Judge Rich, asserts that a statutory basis must be found and that it is § 102(g), which makes all prior inventions "prior art" for the purposes of § 103 if they meet the requirement that they had not been abandoned, suppressed, or concealed. The other protagonist, Judge Baldwin, insists that § 102(g) cannot be the statutory basis for determining obviousness unless there has been a decision in an "interference" proceeding and in the absence of a decision in such a proceeding it is simply not relevant, the true basis for the decision of obviousness being that the prior invention is a kind of "prior art" known to practitioners without actual definition in the statute. The views expressed by Judge Baldwin would seem to open the way for judicial reliance on other undefined "prior art" to defeat patents.

Interestingly, in each case the prior invention and the invention defined in the appealed claims were made by co-workers, so that all inventions in each case were owned by the inventors' employer. The prior inventions of the co-workers became known to the Examiner because of cross-references such as are specified in Patent Rule 77(c). These were treated as binding admissions, particularly in view of additional admissions in affidavits and appeal briefs.

This controversy would not have arisen if the several inventions in each case had been made by *a single employee* of the employer-owner. In such a case, the Patent Office would have followed the principle that an inventor's own prior patent cannot be used to establish that "another" is the first inventor, but can be used only to establish a statutory bar of "patented * * * more than one year before the application", or to establish double patenting.

This controversy would also not have arisen if the several inventions had been made by completely independent inventors. In such a case the earliest date which the

Patent Office could ordinarily use is the filing date of the application for the other patent, under § 102(e) which codifies the Supreme Court decision in *Alexander Milburn Co. v. Davis-Bournonville Co.* 270 US 390 (1926).

However, it would be a mistake to assume that these two decisions involve special situations of limited importance. In infringement suits prior invention under § 102(g) is commonly pleaded and is frequently the subject of intensive discovery, and becomes an important issue fairly often. It is important to know how it should be dealt with in determining whether a claimed invention "would have been obvious". That is, must an "invention made in this country by another" under § 102(g) be used all by itself as a ground of invalidity—to establish only lack of novelty? Or can it be used also as a basis for establishing that the claimed invention would have been obvious? If so, can it be combined with other "prior art" to establish that an invention would have been obvious?

Similar questions arise as to § 102(f) which deals with subject matter in a claim which the applicant "did not himself invent". This phrase obviously means that the applicant acquired or derived knowledge from someone else, or at least from some other source. Outright theft of an entire invention comes under this subsection but is actually rather uncommon. A more frequent situation is the one in which an applicant learns something from a co-worker, or from a supplier, or from a customer, or from a publication, and then makes a change, or an addition, and claims only the changed or amplified invention.

The drafters of our present Patent Act of July 19, 1952 (Title 35 of the United States Code; Public Law 593, 82nd Congress) had an opportunity to define "prior art" so that the meaning of § 103 would be clear. The opportunity was passed up. Apparently this was because some of the drafters thought everyone would know what "prior art" means—like Judges Almond and Baldwin—which means that nobody knows for sure what it

means. Others thought such a definition to be unnecessary because they considered that "prior art" could only mean one of the things specified in the cross-referenced section 102—like Judges Rich and Lane—which still means that nobody knows for sure which ones of the enumerated things in § 102 are "prior art", and which ones state a loss of right rather than being a species of "prior art".

There is an opportunity now to end the confusion once and for all. After several years of struggle with various bills to amend the patent statute, the American Patent Law Association and the Section of Patent, Trademark and Copyright Law of the American Bar Association have reached a general agreement on a Patent Law Modernization Bill including several new features; particularly:

Patent applications could be filed directly by owners of inventions, as in most other countries.

Priority contests (interferences) would still occur, but only after issuance of a patent on the earlier application, and only on request of the later applicant.

"Prior art" is specifically defined to include.

(1) Patents and publications before the claimed invention was made or one year before its filing date

(2) A published U. S. patent with an earlier filing date

(3) Subject matter made known publicly or in public use by another in this country

(4) Subject matter on sale or in public use in this country more than one yeare before the filing date

(5) Subject matter lost to another in a priority contest

(6) Subject matter not invented by the inventor himself but derived from another.

Obviousness is to be determined with reference to the six categories of defined prior art.

If enacted, these provisions would dispose of the dispute between the factions in the Court of Customs and Patent Appeals discussed above.

These provisions will not answer all the questions which can be raised.

One matter of great importance is the proper relation between or among the members of an employed research team.

A little step has been taken in the direction of recognizing that some inventions are basically "house inventions" in which several or many individuals have contributed to a major industrial development worthy of patent protection. This is in permitting owners of inventions to apply for patents, with some limitations.

Our law has previously been based on the concept of individual inventorship. Consequently the law at present recognizes ownership by an employer only after identification of a particular inventor or group of inventors. In the case of major research programs requiring team effort of a number of people this means that the total accomplishment generally has to be divided up into parts each associated with a specified inventor or group of inventors. Patentability of the ultimate achievement of the team is then not based on its importance and unobviousness, but on a decision as to whether any particular part of it was obvious from the last preceding step made by a different individual member of the team.

To be sure, the decisions of priority and patentability of the parts of a research or development activity are not reached in a completely adversary manner. Instead, as pointed out in the decisions in *Hellsund* and in *Bass et al.*, questions of priority of one part with respect to another are generally determined from declarations, admissions, and elections by the owner.

What is the proper philosophy of the law in such a situation? On the one hand, the employer-owner can

justifiably assert that if his team starts at a certain state of knowledge and arrives at an unforeseeable stage of improvement, in reliance on the patent incentive for promotion of progress, it is of no concern to the public whether the ideas all originated with one member of the team or with several or many. The co-workers should not be pitted against one another.

On the other hand, less well financed outsiders could contend that they should have an equal opportunity to participate in new fields of research and development, and should not have to establish a higher level of advance for the efforts they can afford to make than their better financed competitors. Accordingly, if they can afford to work on only one facet of an industrial complex, it might be unfair to them to permit results of a team effort to be evaluated as a whole rather than as a succession of separate steps.

This bit of philosophy is based on the rather common view that § 102 will defeat a patent if a single bit of "prior art" such as a single patent or publication or a single public use meets all the requirements of a particular claim, and that if there are clear differences the provisions of § 103 must govern with the test being whether the claimed invention would have been obvious.

Such a simple, pure distinction is difficult or impossible to maintain in practice since some tribunals consider that equivalents can be considered to be embraced in § 102, and others prefer not to do so.

Perhaps the matter can be put in better perspective by considering that the essential condition for patentability under our constitutional patent system has been the same ever since the first patent statute in 1790—that the invention be "not before known or used".

This condition has been embroidered by various embellishments of language making it clear that certain circumstances are to qualify as particular kinds of prior knowledge or use. Thus when confronted with the situation of a patent having been granted on something clearly described in an earlier filed application for patent, the

Supreme Court declared in *Alexander Milburn Co. v. Davis-Bournonville Co., supra* that the statute of 1874 amended 1897 (R.S. 4886) required the invention to be "not known or used by others in this country, before his invention", and that the prior description, in a patent application of another which was ultimately published as a patent, proved that the later patentee was not the first inventor, and that, in the words of Justice Holmes:

> one really must be the first inventor in order to be entitled to a patent.

This decision was soon codified and is now §102(e). However, neither the decision nor its codification established any new principle of law, as is suggested in the opinion of Judge Baldwin and his comparison of the Milburn case with the much earlier Supreme Court decision in *Pennock v. Dialogue* 27 US 1 (1829).

In the *Pennock* case evidence was presented to show public use of the invention with permission of the inventor for several years before he applied for his patent, and the jury was charged that if they found the evidence to establish such public use before the application they should give a verdict against the plaintiff. The Supreme Court did not review the evidence, but decided only that the charge was correct under the statute of 1793, which made it a condition for patenting an invention, that it be:

> not known or used before the application

The charge to the jury was approved, with a discussion of the meaning of the foregoing phrase, based on comparison with its antecedents including the British statute of monopolies, and the first U. S. patent statute of 1790, as well as common sense principles of construction.

Justice Story in his opinion in *Pennock* correctly pointed out that the condition in the 1793 statute could not mean that the inventor's private knowledge of his own invention and private use of his invention "to enable him to ascertain its competency to the end proposed" would deprive him of the right to a patent. He then said:

We think, then, the true meaning must be, not known or used by the public, before the application.

This is a proper statement when applied to the issue of *loss of right* by the inventor's own public use or by others with his permission before his application, which was the only issue considered by the Court. The quite different issue of priority of invention was discussed with the comment that the 1793 statute as a whole:

gives the right to the *first* and true inventor and to him only; if known or used before his supposed discovery he is not the *first,* although he may be a *true* inventor; (emphasis in original)

but that the first inventor under that statute would lose his rights unless he applies for a patent before "he suffers the thing invented to go into public use".

Evidently, the law has always authorized grant of patents only to the first inventor. Both Justice Story, a century and a half ago, and Justice Holmes, nearly a century later, agree that the statutes they were construing so required. In neither case were there co-workers who participated in research and development of an employer who was the true owner of all their accomplishments and results.

How about the inventor who is really the first to conceive the thing claimed, only to find that bits of the thing are treated as prior art because they came up in discussions with co-workers? Such bits of information might be said to be

not invented by the inventor himself but derived from another

so that he must establish unobviousness over something which is neither public nor in the possession of someone having an actual or possible adverse interest.

Strikingly, the current draft of the Patent Law Modernization Bill goes in two different directions in dealing with closely analogous situations.

The fifth category of prior art in this draft makes a prior invention by another "prior art" for the purpose of § 103 only if there has been an award in a priority contest, which generally occurs only if there is adverse

ownership. This would codify the long standing Patent Office practice.

The sixth category of prior art in this draft makes all matter derived from another "prior art" regardless of whether there is adverse or common ownership. Should this not similarly be limited to adverse ownership situations?

Careful thought should be given by as many people as possible to all the implications of the proposed changes in the patent—defeating conditions of the statute before it goes much further along the legislative path so that we will not be surprised a few years from now by an interpretation which is at variance with our views as to what the law should be.

Donald K. Wedding *
Harvey A. Maertin **

MEASUREMENT OF THE CUMULATIVE EFFECTS OF TECHNOLOGY ON MACROECONOMIC GROWTH

The world's total technical and scientific knowledge has rapidly expanded at an ever increasing rate during the last one hundred years. Any description of this knowledge explosion will by necessity be an understatement, since it is not possible for any one person to be acquainted with even a small portion of the resulting cumulative advance in world knowledge. This is clearly illustrated by the exponential growth rate of scientific journals. There are now approximately 10,000 scientific journals containing original articles and 300 abstract journals [1] which contain over two million new reports of research and development per year.[2] Abstracts of scientific papers from journals and other related publications, which now comprise about 85 per cent of the abstracts by Chemical Abstract Service, have increased at an annual rate in excess of eight per cent since 1950. The annual total is presently doubling every nine years.[3]

The overall technology growth rate has particularly accelerated during the last twenty-five years such that the world's technical and scientific knowledge is estimated to be presently doubling every 12 to 15 years.[4]

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[1] Ellis A. Johnson, "The Crisis in Science and Technology and Its Effect on Military Development," *Operations Research*, Vol. 6, No. 1, January-February 1948, p. 15.

[2] Dale B. Baker, "Communication or Chaos," *Science*, Vol. 169, p. 739, August 21, 1970.

[3] Dale B. Baker, "World's Chemical Literature Continues to Expand," *C. and E. News*, Vol. 49, No. 28, July 12, 1971, p. 37.

[4] D. J. Price, "Quantitative Measures of the Development of Science," *Arch. Int. d'Historie des Sci.*, Vol. 14, pp. 85-93, 1951. As quoted in the Ellis Johnson article above.

In some fields it is doubling every eight years. This growth is further evidenced by a 16-fold increase in total United States scientists and engineers from 1900 to 1954.[5] Since 1945 the growth rate of total United States research has substantially increased relative to the GNP (Gross National Product) growth rate.[6] Such growth has its own distinct problems for the information retrieval experts and also for the social scientists and ecologists who fear that science is outgrowing man's ability to control the potential destructive forces inherent therein. In contrast with the technology growth, knowledge in the social and management sciences appears to be doubling every fifty years or at about the same rate as the population of the world. This relatively slow rate of growth is apparently the result of the fact that in the United States only 2 per cent of all research and development funds are spent on the social sciences.[7]

However, from a positive viewpoint, the increase in technical and scientific knowledge has without question improved the world's overall standard of living. Thus, one may take judicial notice, so to speak, of numerous scientific innovations which have contributed to the employment of millions of people and increased the economic output—in terms of GNP—of every industrialized nation of the world regardless of its political structure.

For example, in the years subsequent to World War II there has been a technological boom in the United States economy which is evident to even the most casual observer. This wealth of innovations in consumer and industrial products can be illustrated by atomic energy,

[5] *The Impact of the Patent System on Research,* Study of the Subcommittee on Patents, Trademarks, and Copyrights of the Committee on the Judiciary, United States Senate, 85th Congress, 2d Session, pursuant to S. Res. 236, Study No. 11, (Washington, D. C.: 1958), p. 29.

[6] *R and D and the Investor,* Merrill, Lynch, Pierce, Fenner, and Smith Inc., N. Y., 1960, p. 3; also *Statistical Abstract of the United States,* U. S. Department of Commerce, 1971, p. 508.

[7] D. J. Price, as quoted in Ellis Johnson article above; also *Statistical Abstract of the United States,* U. S. Department of Commerce, 1971, p. 510.

color television, computers, jet aircraft, automatic household appliances, office copying equipment, the Polaroid camera, etc.

Although not equally self-evident, there has also been in the United States a simultaneous increase in national efficiency and output. If one compares changes in real GNP with changes in the total civilian work force and the total hours of work for the years 1947 to 1965, it will be noted that the relative rate of increase is substantially greater for the real GNP.[8] In other words, the real GNP per working man hour has substantially increased in the United States since World War II.

It is therefore not surprising that economists have attempted to give mathematical recognition to the influence of technology on macroeconomics, e.g., by defining the aggregate production function in terms of capital stock, the labor force, and technical progress.[9] The definition of technical progress, as well as the quantitative measurement thereof, has been extensively debated by modern economists, particularly in terms of inventive activity.[10] The definition of inventive activity has also been at issue.

Typical definitions of inventive activity have included inventive input and/or inventive output or advance. Because an adequate quantitative index for such definitions has not been readily available, economic studies have tended to rely upon patent statistics as an index of inventive activity. Although the use of patent statistics as a measure of inventive activity or technical progress has been the subject of debate,[11] an alternative direct index is not conveniently available other than the reported

[8] U. S. Department of Commerce, *Technological Innovation: Its Environment and Management,* (Washingtin, D. C., January 1967), Chart 2, p. 3.

[9] Thomas F. Dernburg and Duncan M. McDougall, *Macroeconomics* (New York: McGraw-Hill Book Co., 1960), p. 210.

[10] See, for example, *The Rate and Direction of Inventive Activity: Economic and Social Factors,* a report of the National Bureau of Economic Research, New York (Princeton: Princeton University Press, 1962), p. 19-90.

[11] *Ibid.,* p. 75-76 and 78-83.

research and development dollar expenditures of various corporations. However, the definition of research and development varies widely from firm to firm and data is available only on a very limited basis. Furthermore, many firms consider such data to be confidential and proprietary and do not publish it or make it available to researchers.

Some macroeconomic studies have been based on patent statistics, typically being limited to the number of patents issued annually [12] and/or a statistical consideration of such data in light of various economic data.[13] One of the more sophisticated statistical undertakings was presented in a book by Professor Jacob Schmookler of the University of Minnesota.[14] In his book, Professor Schmookler presented and tested several hypotheses including the hypothesis that inventive activity is a function of economic change (instead of vice versa).

However, on the basis of what has been reported in the literature, there have been no studies in regard to the cumulative effects of patents on macroeconomics. It is the purpose of this article to report the results of one such study.

In this study it was proposed as a general hypothesis that the macroeconomic growth of the United States in terms of GNP since World War II is the result of the cumulative gross national technology as measured by patent data cumulated over a given period of consecutive years.

More particularly, the study measured GNP as a function of cumulated patent applications or issued patents over a series of varied time periods ranging from 1 to 17 years, a separate cumulation of patent applications or issued patents being compiled for one year, two years, and so forth through 17 years. Using regression analy-

[12] George E. Folk, *Patents and Industrial Progress* (New York, N.Y.: Harper and Brothers Publishers, 1942).

[13] Wroe Alderson et al, *Patents and Progress* (Homewood, Illinois: Richard D. Irwin, Inc., 1965).

[14] Jacob Schmookler, *Invention and Economic Growth* (Cambridge: Harvard University Press, 1966).

sis, each cumulation of patent data was statistically correlated with GNP over a time span of 1945 through 1966.

Equation (A) is illustrative:

$$(A) \qquad GNP_t = f(\textstyle\sum P_n)$$

where GNP is the U. S. Gross National Product for year t and $\sum P$ is the gross national cumulative patents (total patents) issued for a number of consecutive years n, where n ranges from 1 through 17 years starting at current year t. Thus it was proposed that the GNP for a year t is a function of the gross national cumulative patents $\sum P$ for a number of consecutive years n, $\sum P_n$ being defined as illustrated in equations (1) to (17):

$$(1) \quad \textstyle\sum P_1 = P_t$$

$$(2) \quad \textstyle\sum P_2 = P_t + P_{t-1}$$

$$(3) \quad \textstyle\sum P_3 = P_t + P_{t-1} + P_{t-2}$$

$$(n) \quad \textstyle\sum P_n = P_t + P_{t-1} + P_{t-2} + \ldots + P_{t-x}$$

$$(16) \quad \textstyle\sum P_{16} = P_t + P_{t-1} + \ldots + P_{t-15}$$

$$(17) \quad \textstyle\sum P_{17} = P_t + P_{t-1} + \ldots + P_{t-16}$$

Where $n \leq 17$ and $x = n - 1$

For example, if the U. S. patents are to be cumulated for a three year period, n would be three and equation (3) would be used. If t is the year 1966, the patents would be cumulated (totaled) for the years 1966, 1965, and 1964 and statistically compared with the GNP for 1966. In a similar manner the GNP for 1965 would be statistically compared with cumulated patents for the years 1965, 1964, and 1963; GNP for 1964 with cumulated patents for the years 1964, 1963, and 1962; and so forth for the GNP of each year back to 1945. This process is repeated for each value of n.

Since it was not known in advance which value of n would be optimum, it was necessary to test all 17 possible values of n, using a linear regression model on each of the 17 possible totals of equation (A) and measuring the multiple correlation coefficient r (with corresponding F values) for each n value.

In order to measure possible variations in results due to inflation and/or population, the GNP data was defined in three different ways:

a) GNP in current dollars;
b) Current GNP per capita;
c) Real GNP (adjusted to constant dollars) per capita.

Likewise, the patent data P was defined in three different ways:

a) Annual U. S. patents issued excluding designs, reissues, and plant patents;
b) Annual U. S. patents issued including design patents but excluding reissues and plant patents;
c) Annual U. S. patent applications filed excluding applications filed for designs, reissues, and plant patents.

The GNP data was selected for the t years 1945 through 1966. The patent data was for the years t-16 through t; that is, from 1929 (1945-16) through 1966. The patent application data was for the year 1929 through 1961.

The exclusion of reissues and plant patents is not deemed to be material, since from 1939 to 1955 there was issued an average of 185 reissue patents and 67 plant patents per year compared to an annual average of about 34,500 industrial utility patents. For the same period, design patents averaged about 3,750 per year.

The use of filed patent applications appears justified by data indicating that a relatively constant proportion of U. S. patent applications mature into U. S. patents. Thus, if one determines the ratio of U. S. patents issued to U. S. patent applications filed for the years 1939 to 1961, the average ratio for the period will be about .58 with 21 of the individual years having a ratio of .50 to

.70, six years having a ratio of .25 to .40, and six years having a ratio of .71 to .86.[15]

Using equation (A) and a regression analysis as noted previously, the data was statistically correlated in the following nine different combinations:

(I) GNP versus annual U. S. patents issued excluding designs, reissues, and plant patents;

(II) GNP versus annual U. S. patents issued including design patents, but excluding reissues and plant patents;

(III) GNP versus annual U. S. patent applications filed excluding applications filed for designs, reissues, and plant patents;

(IV) GNP per capita versus annual U. S. patents issued excluding designs, reissues, and plant patents;

(V) GNP per capita versus annual U. S. patents issued including design patents, but excluding reissues and plant patents;

(VI) GNP per capita versus annual U. S. patent applications filed excluding applications filed for designs, reissues, and plant patents;

(VII) Real GNP per capita versus annual U. S. patents issued excluding designs, reissues, and plant patents;

(VIII) Real GNP per capita versus annual U. S. patents issued including design patents, but excluding reissues and plant patents;

(IX) Real GNP per capita versus annual U. S. patent applications filed excluding applications filed for designs, reissues, and plant patents.

Each combination was tested with n varying from 1 to 17. The regression analysis results for the 17-values of n for each of the nine combinations are summarized in TABLES I to IX. Each table corresponds numerically to one of the nine data combinations.

[15] P. J. Federico, "Historical Patent Statistics 1791-1961," *Journal of the Patent Office Society*, Vol. 46, No. 2, February 1964.

The results as presented in TABLES I to IX indicate that peak correlation coefficients r are obtained for n cumulated years of patent data using a multiple regression analysis of GNP data versus the cumulated patent data.

In TABLES I, II, IV, V, VII, and VIII, issued patents were used. Peak r values were obtained for an n value of about six cumulated patent years with a range of five to seven years. The n result was not affected with the inclusion of design patents. Likewise, the result was substantially the same regardless of whether the cumulated patents were correlated with GNP, GNP per capita, or constant dollars GNP per capita. The peak r values were all in excess of 0.9 with the significance of these r values being substantiated by correspondingly high F values.

TABLE I appears to be typical of all of the tables. The corresponding r values, for n values ranging from 1 to 17, start at .797 for n=1, peak at about .934 for n values of 6, 7, and 8 years of cumulated patents, and gradually decline to about .622 for n=17.

Thus, it appears that a peak r value is obtained for about six consecutive years of cumulated issued patents. It further appears that patents which are more than six years old, e.g., for n values of about 7 to 17, have a decreasing effect on GNP. Therefore, it may be concluded that the peak macroeconomic influence of U. S. patents tends to be about six years.

TABLES III, VI, and IX summarize the results of GNP correlated with filed patent applications. Peak r values of .821 to .981 (with correspondingly significant F values) were obtained for an n value of about 8 to 10 years. Considering the fact that a patent application typically pends before the U. S. Patent Office for about two to four years, such n result appears to be consistent with the n value of 6 obtained for issued U. S. patents.

In conclusion, this study indicates that a U. S. patent has an effective economic statistical life of about six years and that there is a statistically significant cor-

relation between cumulated issued patents (or patent applications) and GNP data. Furthermore, this study indicates the need for more statistical studies using cumulative patent data as an index of cumulative technology and the influence of such technology on both macroeconomic and microeconomic growth.

TABLE I

GNP versus cumulative annual U. S. patents issued excluding designs, reissues, and plant patents:

n	r	F
1	0.797	34.837 (1,20)
2	0.872	63.329 (1,20)
3	0.890	75.989 (1,20)
4	0.906	91.653 (1,20)
5	0.925	118.896 (1,20)
6	0.933	133.401 (1,20)
7	0.934	135.599 (1,20)
8	0.933	134.055 (1,20)
9	0.926	119.457 (1,20)
10	0.911	97.239 (1,20)
11	0.893	78.760 (1,20)
12	0.867	60.667 (1,20)
13	0.836	46.310 (1,20)
14	0.795	34.301 (1,20)
15	0.744	24.812 (1,20)
16	0.688	18.017 (1,20)
17	0.622	12.635 (1,20)

TABLE II

GNP versus cumulative annual U. S. patents issued including design patents, but excluding reissues and plant patents:

n	r	F
1	0.781	31.234 (1,20)
2	0.858	55.620 (1,20)

3	0.878	67.544 (1,20)
4	0.898	83.161 (1,20)
5	0.917	106.056 (1,20)
6	0.924	116.228 (1,20)
7	0.922	114.170 (1,20)
8	0.920	109.827 (1,20)
9	0.909	94.757 (1,20)
10	0.888	74.832 (1,20)
11	0.864	59.131 (1,20)
12	0.832	44.876 (1,20)
13	0.793	33.933 (1,20)
14	0.745	24.924 (1,20)
15	0.687	17.877 (1,20)
16	0.625	12.832 (1,20)
17	0.551	8.727 (1,20)

TABLE III

GNP versus cumulative annual U. S. patent applications filed excluding applications filed for designs, reissues, and plant patents:

n	r	F
1	0.503	5.074 (1,15)
2	0.573	7.422 (1,15)
3	0.663	11.754 (1,15)
4	0.739	18.008 (1,15)
5	0.810	28.600 (1,15)
6	0.883	53.061 (1,15)
7	0.941	116.791 (1,15)
8	0.975	290.773 (1,15)
9	0.981	377.174 (1,15)
10	0.972	253.345 (1,15)
11	0.960	175.066 (1,15)
12	0.952	146.049 (1,15)
13	0.949	137.006 (1,15)
14	0.951	141.717 (1,15)
15	0.946	128.810 (1,15)
16	0.921	83.769 (1,15)
17	0.865	44.695 (1,15)

TABLE IV

GNP per capita versus cumulative annual U. S. patents issued excluding designs, reissues and plant patents:

n	r	F
1	0.814	39.312 (1,20)
2	0.575	7.422 (1,15)
3	0.905	90.436 (1,20)
4	0.917	106.081 (1,20)
5	0.930	127.694 (1,20)
6	0.930	127.948 (1,20)
7	0.924	117.340 (1,20)
8	0.917	105.670 (1,20)
9	0.904	89.518 (1,20)
10	0.885	72.155 (1,20)
11	0.863	58.525 (1,20)
12	0.834	45.673 (1,20)
13	0.799	35.332 (1,20)
14	0.755	26.453 (1,20)
15	0.700	19.252 (1,20)
16	0.641	13.985 (1,20)
17	0.573	9.762 (1,20)

TABLE V

GNP per capita versus cumulative annual U. S. patents issued including design patents, but excluding reissues and plant patents:

n	r	F
1	0.797	34.933 (1,20)
2	0.874	64.895 (1,20)
3	0.895	80.082 (1,20)
4	0.911	97.092 (1,20)
5	0.923	115.342 (1,20)
6	0.922	112.939 (1,20)
7	0.913	100.344 (1,20)
8	0.903	88.279 (1,20)
9	0.885	72.438 (1,20)

10	0.859	56.531 (1,20)
11	0.831	44.681 (1,20)
12	0.795	34.266 (1,20)
13	0.753	26.191 (1,20)
14	0.702	19.380 (1,20)
15	0.641	13.929 (1,20)
16	0.577	9.959 (1,20)
17	0.501	6.702 (1,20)

TABLE VI

GNP per capita versus cumulative annual U. S. patent applications filed excluding applications filed for designs, reissues, and plant patents:

n	r	F
1	0.445	3.711 (1,15)
2	0.528	5.808 (1,15)
3	0.630	9.897 (1,15)
4	0.719	16.044 (1,15)
5	0.801	26.855 (1,15)
6	0.882	52.638 (1,15)
7	0.944	123.931 (1,15)
8	0.978	329.455 (1,15)
9	0.980	363.354 (1,15)
10	0.966	209.590 (1,15)
11	0.949	134.759 (1,15)
12	0.935	105.051 (1,15)
13	0.928	93.494 (1,15)
14	0.926	90.199 (1,15)
15	0.916	77.929 (1,15)
16	0.882	52.770 (1,15)
17	0.818	30.255 (1,15)

TABLE VII

Real GNP per capita versus cumulative annual U. S. patents issued excluding designs, reissues, and plant patents:

n	r	F
1	0.739	24.125 (1,20)
2	0.832	44.959 (1,20)
3	0.858	55.740 (1,20)
4	0.892	77.822 (1,20)
5	0.922	113.302 (1,20)
6	0.931	130.698 (1,20)
7	0.932	131.790 (1,20)
8	0.920	110.846 (1,20)
9	0.900	85.081 (1,20)
10	0.877	66.542 (1,20)
11	0.857	55.440 (1,20)
12	0.837	46.804 (1,20)
13	0.821	41.241 (1,20)
14	0.803	36.218 (1,20)
15	0.775	30.028 (1,20)
16	0.734	23.376 (1,20)
17	0.680	17.192 (1,20)

TABLE VIII

Real GNP per capita versus cumulative annual U. S. patents issued including design patents, but excluding reissues and plant patents:

n	r	F
1	0.725	22.157 (1,20)
2	0.820	41.137 (1,20)
3	0.849	51.558 (1,20)
4	0.888	74.745 (1,20)
5	0.923	115.509 (1,20)
6	0.935	139.946 (1,20)
7	0.935	139.165 (1,20)
8	0.921	111.125 (1,20)
9	0.894	79.350 (1,20)
10	0.863	58.130 (1,20)
11	0.835	45.992 (1,20)
12	0.807	37.252 (1,20)
13	0.783	31.722 (1,20)

14	0.760	27.268 (1,20)
15	0.728	22,535 (1,20)
16	0.685	17.635 (1,20)
17	0.626	12.884 (1,20)

TABLE IX

Real GNP per capita versus cumulative annual U. S. patent applications filed excluding applications filed for designs, reissues, and plant patents:

n	r	F
1	0.327	1.793 (1,15)
2	0.254	1.035 (1,15)
3	0.255	1.044 (1,15)
4	0.321	1.718 (1,15)
5	0.436	3.530 (1,15)
6	0.584	7.747 (1,15)
7	0.712	15.401 (1,15)
8	0.796	25.913 (1,15)
9	0.821	31.024 (1,15)
10	0.813	29.141 (1,15)
11	0.783	23.697 (1,15)
12	0.747	18.883 (1,15)
13	0.718	15.938 (1,15)
14	0.717	15.911 (1,15)
15	0.735	17.654 (1,15)
16	0.749	19.145 (1,15)
17	0.730	17.153 (1,15)

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