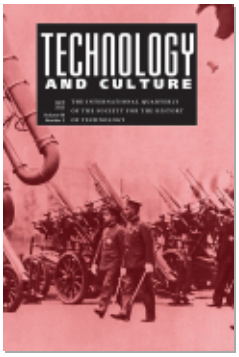
Patents In Miniature: The Effects of Microfilm as an Information Technology, 1938–68



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Patents In Miniature: The Effects of Microfilm as an Information Technology, 1938–68

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ABSTRACT: How did microfilm come to shape patent work? This article shows that, despite initial resistance to the new medium, microfilms changed not just search rooms but international connections and collaborations. It traces how legal and media technologies coalesced by considering how microfilm changed the patent office and the work of patent examiners and information brokers. As a photographic medium, microfilm enabled patents to be seen differently: not merely as documents, but as a distinct literature that could be abstracted, linked, and disseminated. The article explores how microfilm technology changed the ways that patents were organized, distributed, and used.

Introduction

Media technologies, whether paper based or digital, give rise to questions about how patents were processed and construed historically. Technological changes reconfigured the way people accessed, read, and circulated patents. Such technological changes have affected perspectives of the patent system over time. Patent offices adopted a more constructive and sympathetic attitude toward the emergence of a patent information industry because of media technologies. While recent studies have examined the history of patent document digitization, one area requiring scrutiny involves the early attempts to standardize, process, and convert patent files into microfilms at different times throughout the twentieth century.[1] This underexamined history is significant from a sociological as well as a legal and historical standpoint. The most striking aspect of such an inconspicuous technology is how it hovers

1. For a discussion of the technological relationship of patents to digitization: Kang, "Ghosts of Inventions."

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APRIL
2023
VOL. 64

uneasily between preservation and exploitation—at a relay point between the market and the state and between openness and secrecy. Microfilming projects elucidated how patent literature could serve both as a source of legal documentation and technical information precisely because of the technology's capacity to reproduce paper and build information retrieval systems.[2] The value of microfilming technology was its adaptability and capacity to be copied, creating the conditions for exchanging copies of patent specifications. Crucially, microfilms were neither documents nor databases: they could be converted into documents or linked to databases to enhance operations around patent applications such as examination, translation, and search.

At the interface between patent offices and the outside world, microfilming schemes were rooted in social and technological postwar circumstances—for instance, underpinning the U.S. science advisor Vannevar Bush's prescient vision of technology.[3] Bush advocated for developing machines for storing and disseminating information at a time when patent offices were changing and modernizing, thus establishing fertile ground for patent information management ventures and global metrication exercises in the era before digital technologies. Such experiments with microfilms, microfiches, and microforms were arguably precursors of later attempts to computerize and automate patent literature. Indeed, as with all new technologies, microfilming projects were full of promise, but they also elicited anxieties, particularly around storage and dissemination. Microfilm does not facilitate a history of origins or of success—in fact, quite the opposite. As a neglected scholarly no-man's-land, an exploration of its development and adoption bears insightful material for historical reflection about patents. Mapping the changing circumstances that made microfilms (or microforms) into patents or patents into microfilms demonstrates their role in facilitating connections among patent offices and between them and business communities. The material and cultural contexts of microfilming patents and the reproductive capacity of microfilm became transformative agents in patent work, expanding its purview and facilitating the rise of an information industry around it. Microfilm's impact was much wider than simply preserving paper-based documents. Microfilming projects contributed to shaping practices, institutions, and ways of reading patents, altering their circulation and dissemination in the post–World War II era.

From Preservation to Exploration

What were the potential uses of microfilm for patents? This question dates to the late 1930s, when newly appointed Assistant Secretary of Commerce Richard C. Patterson Jr. specifically addressed it to Conway P. Coe, the U.S.

2. A. H. David Rowse, "Information Retrieved," *Guardian*, October 1, 1969, 16; "Machine Tool Management," *Illustrated London News*, November 1, 1969, 33.

3. Wilds, "Information Retrieval"; Gipe, *Nearer to the Dust*, 98–100.

commissioner of patents from 1933 to 1945.[4] Patterson recalled using the technology and highlighted how convenient it was to have the patents of a specific class microfilmed to perform searches in-house. So why not explore using this technology in the patent office? Although his suggestion was perhaps too businesslike for a government agency, the U.S. Patent Office did explore the introduction of microfilm, leading to concerns and identifying a series of obstacles that floated around for many decades.

The main concern was the feasibility of microfilm in a place historically so dependent on paper for its operations.[5] Unlike other bureaus, the patent office was constrained in its use of microfilm, according to preliminary investigations, by its obligation to supply not only information but also complete patent records.[6] Furthermore, the need for specific microfilm equipment unsettled the patent office's established routines, in terms of both cost and how its search room traditionally functioned. Microfilming would involve bringing in staff and equipment from a company such as Kodak to photograph patent records. According to the U.S. Patent Office chief clerk, this would disrupt the office's everyday activities and its legitimacy. On the one hand, it would be difficult to introduce viewing equipment without upsetting a search room organized in "rows of church-like pews," a description of the search room from 1950.[7] On the other hand, printing and selling copies of patents were the recognized statutory responsibility of the patent office, so the business of generating microfilm copies for sale would also be problematic. The office's work—constantly adding and examining patent applications—would require either continual preparation of new film or ongoing revision of films already in use. Installing a permanent microfilm system would threaten not only the office's income but also its very operations. The clerk argued this point, highlighting that he did not believe that "any outsider should be given the authority to furnish the records of the patent office." In his view, permitting a company to come in and make copies of patent office records would open the door to any other company that made this request; as microfilming could take over the current method of furnishing copies of records, these companies would consequently be able to exclude the patent office.[8]

The U.S. Patent Office viewed its mission as a record-issuing authority based on two aspects of its administrative and processing roles: exclusivity

4. Richard C. Patterson Jr. to Conway P. Coe, May 25, 1938, box 8, file 11, record group 241, NARA.

5. "It was a paper item—the specification—that eventually put the 'intellectual' into intellectual property" (Biagioli, "Patent Republic," 1143).

6. Richard C. Patterson Jr. to William Pratt, National Microfilming Company, June 21, 1938, box 8, file 11, record group 241, NARA.

7. Lehman, "Wizards of the Basement Workshop," 38.

8. James A. Brearley, chief clerk, U.S. Patent Office, to Conway P. Coe, August 1, 1938, box 8, file 11, record group 241, NARA.

APRIL
2023
VOL. 64

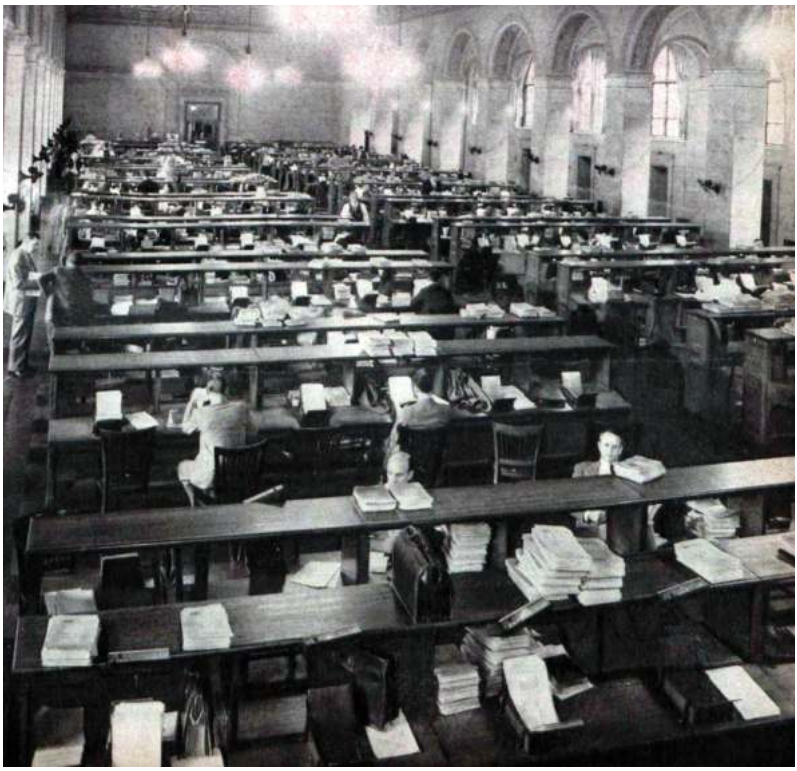

FIG. 1 The public search room of the U.S. Patent Office, 1950. At the beginning of the twentieth century, the U.S. Patent Office's model room was converted into the public search room. This image shows its seating arrangement, with parallel rows of pews, which was considered to be an obstacle for microfilming projects—and thus for introducing the new technology. (Courtesy of the Hagley Museum and Library.)

regarding the right not only to issue but also to print patents, and control over its facilities. These two aspects were woven into the office's physical layout, related directly to performing a public service. The arrangement of the search room illustrates this point (see figure 1). The orderly rows of benches of a standardized, uniform height had a leveling effect, which was one way to ensure access to and control over the use of patent records. Unsurprisingly, this layout led to problems and complaints about underhand behavior, such as "sleepers"—early comers who reserved seats by leaving a hat, briefcase, or other handy item on them "for a friend or associate, expected later."[9] Despite arguments that a comprehensive microfilming project was not appropriate for

9. Arthur T. Davenport, patent attorney, to the commissioner of patents, May 4, 1953 (on "search room facilities"), box 4, file 7, record group 241, NARA.

patents, it seems that the clerk was eager to distinguish between the office's public search room and the Library of Congress, the National Archives, and the National Agricultural Library, whose popular "bibliofilm" project was often mentioned as an example by those demanding that the patent office introduce a similar service.[10]

Although the specific characteristics of patents as documents and the patent office as a record-issuing authority appeared to preclude microfilming ventures, the benefits attributed to the medium over paper were so persuasive that preliminary schemes emerged.[11] Albeit tentatively, the office's first microfilm project began in May 1938, just when Patterson first suggested the technology to Coe.[12] Ironically, the argument triggering this project was that microfilm facilitated access to patents that would otherwise be lost. As a storage technology, microfilm helped eliminate the fear of loss that haunted an office in thrall to the paper imperative. Microfilm resolved the threat of paper deterioration—a problem the office could not ignore—and contributed to the archival permanence of records and their circulation. As using paper-based patents for search purposes was one reason for the precarious state of some batches, microfilming offered an opportunity to preserve them by using reels as paper substitutes.[13]

This early shift from paper to film was limited to a set of patents used in the U.S. Patent Office for search activities. They were old British patents, printed on wood pulp paper that had deteriorated alarmingly, which was increasingly worrying because the patent office in London no longer printed them. Microfilm became a pragmatic solution to replacing the bulk of these increasingly flimsy British patent specifications. Indeed, all parties involved, such as patent clerks, examiners, and other users like scientists, engineers, and patent agents, agreed that the technology could offer an answer to that pressing issue.

The patent office considered microfilming again a few months later, having identified a problem with its limited storage capacity. Photographing patents onto microfilm could solve the "very serious problem of finding space for the filing and storage of its soft copies."[14] Although storage was

10. Lloyd P. Morris to Conway P. Coe, February 25, 1939, box 8, file 11, record group 241, NARA. Librarian Claribel R. Barnett explains the service, which was operated by the American Documentation Institute: Barnett, "The Bibliofilm Service of the U.S. Department of Agriculture Library." Also: Davis, "Microfilms Make Information Accessible"; Seidell, "Utilization of Microfilms," 32.

11. On the special characteristics of patents as documents: Hemmungs Wirtén, "How Patents Became Documents, or Dreaming of Technoscientific Order, 1895–1937."

12. Patterson to Coe, May 25, 1938, box 8, file 11, record group 241, NARA.

13. James A. Brearley to Conway P. Coe, May 28, 1938, box 8, file 11, record group 241, NARA.

14. A. C. Mills to Malcolm Kerlin, November 3, 1938, box 8, file 11, record group 241, NARA.

APRIL
2023
VOL. 64

an internal problem that did not directly involve relations with the outside world, it highlighted a technological dimension that would link patents and microfilm for years to come.

Given the role that microfilms played within the patent office, the importance of Vannevar Bush's vision of mechanized information retrieval looms large.[15] Bush was the director of the Office of Scientific Research and Development during the Second World War and coordinated scientific research for military purposes. In the early 1940s, he aimed to align his proposed new rapid selector—a machine that would store volumes of information on microfilm and allow a user to quickly select and project documents onto a screen—with these early microfilm projects at the patent office.[16] For more than a decade, Bush took an active interest in the problems increasingly overwhelming the U.S. Patent Office in patent handling, search, and retrieval.[17] He visited the office on various occasions to study and discuss its operations.[18] His experience and expertise culminated in his appointment, in 1955, to head a committee "to study the possibilities of electronic equipment that would aid in the patent search."[19] This endeavor involved a thorough investigation of the potential to mechanize search operations and install more suitable techniques and equipment in the patent office.[20] Among those drowning in information, Bush had already identified the patent attorney, who "has on call the millions of issued patents, with familiar trails to every point of his client's interest."[21] He thought that microfilms would be the most practical way to convey large volumes of information to their potential users, highlighting that

> the combination of microfilm facsimile records with punched cards and with electronic data processing [was] making great strides. The photographic method with its enormous compression of storage space, and its facility in bringing the actual data in facsimile form immediately to the user, [was] capable of extraordinary versatility.[22]

15. Zachary, *Endless Frontier*, 261–62.

16. Justin W. Macklin to Conway P. Coe, February 29, 1940 (on Vannevar Bush's letter), box 8, file 11, record group 241, NARA.

17. Vannevar Bush to Caspar Ooms, commissioner of patents, September 20, 1946, box 90, General Correspondence, Patent Office, 1943–54, VBP.

18. Caspar Ooms to Vannevar Bush, October 7, 1946, box 90, General Correspondence, Patent Office, 1943–54, VBP.

19. Bush, "Some Proposals for Improving the Patent System"; "Advisory Committee on Application of Machines to the Patent Office Operations," *American Documentation* 6, no. 1 (1955): 56.

20. James C. Worthy and Robert C. Watson to Sinclair Weeks, Secretary of Commerce, July 22, 1954, box 90, General Correspondence, Patent Office, 1943–54, VBP.

21. Bush, "As We May Think," 108.

22. Vannevar Bush to Norman T. Ball, November 19, 1954, box 90, General Correspondence, Patent Office, 1943–54, VBP.

Although Bush foresaw the importance of microfilming for patents, the way the patent office gradually overcame its initial reluctance to the technology is perhaps more mundane and less reflexive, relying on unforeseen events and contingencies.

The Second World War affected the transmission of patent documents, particularly after airmail paper restrictions.[23] The preservation and storage of patents were less problematic than the processing of patent matters.[24] These restrictions directly affected the traffic of patent documents and the capacity to address and correspond with offices in order to file, oppose, or take out patents, not just in the United States but also abroad. This challenge meant taking advantage of the Paris Convention priority right that allowed subsequent filings in contracting states. Microfilming patent papers freed up space on cargo planes, bypassing regulations that restricted the weight of airmail letters to a maximum of two ounces.[25] In this way, microfilm's space-saving properties kept the patent system functioning by maintaining the international flow of applications in wartime. In addition to facilitating the patent system's operation, the medium proved valuable as a tool for librarians to exchange scientific and technological information during the war. When Max Frumkin published his history of patents, he recalled how the librarian of the patent office in London procured a microfilm from abroad for him with important material for his research during the war.[26] However, it is evident that microfilms did not just contain historical material; they could cover patent documents too, both applications and grants, bringing them closer to the reader. Microfilming became a technique for copying and shipping enemy-owned patents in a sensitive worldwide context where specific patents could be either seized or affected by secrecy orders. This feature explains why microfilms became associated with the language of espionage for making commercial and military intelligence either secret or publicly available.[27]

Thanks to microfilm's small size and portability, microfilming operations straddled the divide between secrecy and knowledge during and after the war.[28] Although its ability to conceal or infiltrate secret information is evident in popular culture, microfilm's capacity for transferring information was notably enhanced with the attempts to release scientific information after the

23. "Order No. 17471 from the Postmaster General," *United States Postal Bulletin*, April 20, 1942, 1–2 (restricting size and weight of parcels); "Order No. 18605," *United States Postal Bulletin*, September 4, 1942, 1 (banning parcels entirely and restricting letter mail to two ounces).

24. "Microfilm for Foreign Patent Applications," *Journal of the Patent Office Society* 24, no. 11 (1942): 792; "Microfilm," 870.

25. For a general overview: Tate, "Microphotography in Wartime," 133.

26. Frumkin, "Early History of Patents for Invention," 21.

27. Jansen and Weyl, "Spy at Work." Also: "More Enemy-Owned Patents Taken Over by Washington," *Los Angeles Times*, June 24, 1942, 7.

28. "Microfilm in the News," May 22, 1946, box C13, folder 4, National Microfilm Association Records, UM.

APRIL
2023
VOL. 64

war.[29] German patents labeled "Streng Geheim" (top secret), such as those related to the nerve agent Tabun, circulated on microfilm rolls in wartime, but they were also copied, translated, and disseminated using microfilms across Allied territories after the war ended.[30] In addition, microfilms of pending patent applications in Germany were among the first items seized or impounded by the Allied occupation authorities, who copied them for distributing to the American, British, French, and Russian governments.[31]

The prominent role that microfilm acquired in the duplication of seized German records was pivotal for the technology's use in patent offices.[32] The industrial demand for enemy data initially posed a dilemma: whether it was preferable to microfilm original source material in Europe and ship microfilms to the United States for analysis and cataloguing or to transport the originals.[33] Policy and technical reasons, such as the need to hasten these operations, drove the decision to release the material via microfilm.[34] Unlike other media technologies, its double-processual capacity to conceal and release information gave microfilm a specific juridical character: microfilm promised a "transfer science," or what Cornelia Vismann has defined as a "juridical apparatus of knowledge as an administrative machine."[35] Microfilmed copies of German patents were initially shipped to Allied countries such as the United States, Britain, and France.[36] In April 1947, almost a hundred large biscuit tins containing such reels arrived at the British patent office and were used as master films to produce further copies for immediate use.[37] The aim was to prepare a so-called safety base negative for preservation, as well as to unveil the applications for inspection at the earliest possible moment. Hence, several copies were prepared to make the films accessible to industrial firms and the public. A year later, the British patent

29. Auerbach and Gitelman, "Microfilm," 749.

30. "News in Brief," *Aslib Information* 73 (1946): 2–4; C. L. Wheeler, memorandum on translations of German microfilm copies of patents and patent applications, February 1948, WO 188/146, TNA.

31. Note of the Board of Trade, German Division, March 13, 1947, regarding microfilm of German patent applications, STAT 14/269, TNA. Also: Frederick Ch. Allison to Mrs. M. Tjaden, Foreign Office, German Section, London, "Microfilming of German Patents," September 30, 1948, FO 371/70968, TNA.

32. Kathy Peiss sets much of this activity in a wider context: Peiss, *Information Hunters*, 88.

33. "First Meeting of the Committee on Release of Scientific Information," September 12, 1945, box 161, Commissioner's Subject Files, 1925–66, record group 241, NARA.

34. *Bibliography of Scientific and Industrial Reports*, 8, no. 9, U.S. Department of Commerce, Office of Technical Services, February 27, 1948, 838–39.

35. Vismann, "Jurisprudence," 284.

36. E. G. Lewin to all regional research officers, "Status of the German Patent and Trade Mark Systems," FO 1032/93, TNA.

37. W. J. Hawkes, Patent Office, to the secretary, Ministry of Works, June 27, 1947, STAT 14/269, TNA.

office announced that the microfilmed patents were available for public inspection in its library.[38]

The patent office did, however, struggle to offer full access, owing to lack of staff and other organizational constraints. Accessibility was restricted by the requirement of prior appointments and the limited number of machines and facilities available to view the microfilms. Despite these constraints, almost two hundred users requested access and read these patents in the office's microfilm readers in 1949.[39] This shows not only that microfilms permitted the use of patent materials but also that their use was mediated by the availability of specific machines. The technology had a direct impact on the very notion of reading patents, now reconfigured as a mechanical operation performed at viewing stations installed in patent offices.

Celluloid Circulations

Perhaps the most remarkable aspect of microfilm was its parasitical character as a medium that relied on paper to exist.[40] It was even more conducive to reproduction than paper, an advantage when it came to disseminating copies across patent offices. Microfilmed patent documents contributed to the flow and distribution of copies of patent specifications, giving rise to what Monika Dommann has described as distinct "celluloid circulations."[41] Preliminary attempts to provide microfilm copies in national patent offices' search rooms emerged in the late 1940s. But, as the above demonstrates, the British patent office had difficulties in furnishing them to the public at first, allocating the remaining copies to the exchange network between patent offices. These microfilmed patent specifications were a relay point between the British office and its counterparts in Belgium, China, Colombia, Czechoslovakia, the Netherlands, and Poland, eager to receive copies with technical commentaries made in London.[42] The copies also circulated in Commonwealth countries, including India and Australia.[43]

These exchange arrangements were significant not just as a form of "intellectual reparation" after the war but also because they occurred at a time of

38. "Patents," monthly report, Trade Marks, Patents and Designs Limited (TMPDF), December 1948, MSS.200/F/3/E5/29/8, Federation of British Industries Archives, MRC.

39. "Patent and Trade Mark Applications," *Times* (London), June 10, 1950, 9.

40. Lindström, "Drömmar om det minsta," 82–85.

41. Dommann, *Authors and Apparatus*, 85–104.

42. Note to B. E. F. Gage, chargé d'affaires of Great Britain, March 2, 1948, FO 371/70965, TNA.

43. W. Nind, Commonwealth Relations Office, to A. S. Lall, India Supply Commission, September 26, 1947, E(B) 15460/48, Treatment of German Patents, L/E/8/7/7181, IOR. Thanks to Hyo Yoon Kang for this material.

APRIL
2023
VOL. 64

debates on the patent system's role.[44] The microfilm network anticipated the shift in patents from documents to information. Microfilm technology was now used to send copies not just of German wartime patents but also of postwar patent applications—British and otherwise—abroad.[45] As a resource filling the gaps in patent search material, the new microfilm circuit had the power to replace and provide out-of-print copies. Although wartime disruption had exacerbated the operational problems of sharing patent specifications around the world and developing a meaningful infrastructure for novelty searches within patent offices, these exchanges offered an immediate and convenient solution to patent offices' archival needs.

As official channels such as Her Majesty's Stationery Office (HMSO) in Britain could not satisfy the demand for copies quickly, some governments sought alternatives. Caspar Ooms, the U.S. commissioner of patents from 1945 to 1947, was particularly concerned with the patent office's difficulties in keeping abreast of scientific information.[46] One solution was requesting access to microfilmed patents to "make photographic reproductions for our own files."[47] In 1952, a British patent office civil servant lamented "how the Germans are so keen on receiving copies of the outstanding specifications that they are prepared to consider paying a private firm to make microfilm copies of them."[48] It is no wonder, then, that microfilming projects coincided with the rise of information entrepreneurs alongside patent offices. Less hampered by bureaucracy, several companies mediated between patent offices and agents, often fast-tracking the microfilming projects and demonstrating that the relationship between patents and knowledge is often more intricate than it appears at first glance. Microfilm became central to the information explosion of the postwar years.[49] Not just a means of collating and disseminating research and development amassed secretly in wartime, microfilm also helped to disseminate patent material after the war.[50] Several law publishers took advantage of patent offices' constraints and microfilmed the U.S. Patent

44. Ooms, "What Should Be Done to Make Our Patent System More Effective in the Accomplishment of Its Intended Purpose?," 5. For a detailed analysis of how German scientific and technical know-how was exploited after the war: Gimbel, *Science, Technology, and Reparation*.

45. C. H. Russell, Patent Office, London, to A. C. A. Taylor, HMSO (request from the Belgian embassy in London), April 17, 1953, STAT 14/269, TNA.

46. "Conference of Primary Publication, National Research Council, February 11, 1950" (opening remarks by Detlev W. Bronk), box K2, folder 33, National Microfilm Association Records, UM.

47. Caspar Ooms, commissioner of patents, to John C. Green, November 22, 1946, box 161, Commissioner's Subject Files, 1925–66, record group 241, NARA.

48. C. H. Russell, Patent Office, London, to J. L. Wilkinson, HMSO, November 17, 1952, STAT 14/269, TNA.

49. Monty Hyams, "Some Problems of a Database Producer: Address to the Information Industry Association Annual Meeting, October 8, 1980," MYHS/3/1/8, MYHS.

50. O'Reagan, "Science, Technology, and Know-How," 35.

Office's *Official Gazette* and U.S. patent specifications.[51] Patent microfilming demonstrated that multiple copies of patent specifications could be made outside patent offices, paving the way for an industry that saw patent information as its product.

The informational dimension of patents elicited by microfilms significantly influenced the emergence of professionally managed collections of copies, abstracts, and indexes of patent specifications. The main point is that microfilm facilitated additional ways for patents to "function" as an informational resource. Microfilms differed from previous paper copies in that they were truly a "transfer technology," giving faster access to a mass of patent information in a more portable form. This characteristic was especially important for companies like the chemical multinational DuPont, which operated in many countries and therefore had to be mindful of competition and patents in various jurisdictions.[52] In 1967, DuPont's central research department microfilmed British, French, and German patents owing to the limited space in the company's Lavoisier Library, which held the printed volumes.[53] Many other multinationals—pharmaceutical, electrical, and more—developed similar schemes alone or in collaboration with information providers such as Documentation Inc., Research Publications Inc., or Derwent Information Ltd.[54] This process entailed buying microfilm editions, leasing them, or somehow microfilming not only patent specifications but also patentee cards, which were the traditional way to search and observe operations of patents owned by or licensed to a company or its competitors.

Unsurprisingly, these microfilm projects launched a debate over the ownership of that information. The issue of copyright and microfilm legality had been raised in previous forums—for example, at the Royal Society Scientific Information Conference in 1948, when microfilmed patent applications were at stake.[55] Two decades later, other issues came into play, particularly the relationship between copyright and government publications.[56] The

51. "Off the Press," *Special Libraries* 42, no. 4 (1951): 153. Also: Price, "Microcard Foundation."

52. Les E. Rasmussen and James G. Van Goot, "Operations of DuPont's Central Patent Index," 202, accession 2222, series 1, box 1, DPA.

53. "Report to the Executive Committee from the Development Department, April 16, 1970 (regarding the Central Patent Index), accession 2222, series 1, box 1, DPA.

54. Horace B. Fay, assistant commissioner of patents, to John K. Wise, patent department, U.S. Gypsum Company, January 2, 1963 (recommending Derwent publications), box 8, file 11, record group 241, NARA; Albert F. Kamper to Paul Ferster (Research Publications Inc.), April 25, 1978, Deputy Director's Office Collection, CLP.

55. Ernest H. Huntress, "Informal Report Trip to Royal Society Scientific Information Conference, 1948," 19, box M4, folder 28, National Microfilm Association, UM.

56. Vernon D. Tate to Ross Gray, DuPont, June 23, 1969, box C19, folder 29, National Microfilm Association Records, UM. Also: Curtis G. Benjamin, "Copyright and Government: A Sea of Troublesome Questions" (conference paper, ca. 1966), box 13, Garfield Papers, SIA.

APRIL
2023
VOL. 64

technological changes wrought by microfilms created tension between public access and private repackaging of patent information, often with copyright implicated as an obstacle for disseminating scientific information.[57] In countries like Britain, Crown copyright existed in patent documents, and there was initial hesitation as to whether to allow private companies to make a business out of patent documents.[58]

Patent and scientific information providers such as the Institute of Scientific Information or Derwent Publications took steps to attempt to overcome copyright problems via negotiation, litigation, and settlement.[59] However, once scientific and technical information became a professional discipline and an industry, their combined strength had an opposite effect.[60] Consequently, some government printing offices refrained from competing with commercial ventures that claimed to provide "adequate and economical service to the public."[61] Moreover, these private initiatives were continuously pushing patent offices to improve the print quality of patent specifications because poorly printed originals and variations in paper color (even in the same document) were considered a significant technical problem in filming them.[62] These exchanges between patent offices and information entrepreneurs were usually in the form of quid pro quo arrangements—the office gave data to companies that programmed and returned it as information products that became part of the exchange deal.[63] The rationale was that patent information products and services increased the use of patent data, and hence the arrangement was beneficial for all parties involved.[64] As highlighted later, however, creating such information products as patent abstracts led to a critical decision to shift from manual to machine-oriented procedures to search and retrieve patents. Once data began to be programmed outside the office, the use of patent information increased, but it came to be mediated by external systems that encoded and recorded it for machine operations.[65]

57. Zurkowski, "Post-Gutenberg Copyright Concepts."

58. This was uncertain until a legal controversy brought the issue to court: Catnic Components Ltd. v. Hill and Smith Ltd., (1982) R.P.C. 183.

59. "Patent Specifications on Microfilm," *Special Libraries* 63, no. 9 (1972): 419; "Study Group on Microfilm Facilities: November 25, 1968," BT 296/253, TNA.

60. The main organization for the emerging professional discourse was the Information Industry Association established in 1968: "Information Industry Association (IIA) Is Formed," *Scientific Notes* 10 (1968): 9.

61. Jeffrey Norton's report, Information Industry Association, April 11, 1971, box 26, Garfield Papers, SIA.

62. Microform notes, Derwent Publications Ltd., 1982, MYHS/1/13/12, MYHS.

63. Eugene Garfield to William T. Knox, October 12, 1971, box 73, Garfield Papers, SIA.

64. Francis W. Wolek to Eugene Garfield, September 30, 1977, box 73, Garfield Papers, SIA.

65. Report to the Executive Committee from the Development Department, April 16, 1970 (regarding the Central Patent Index), accession 2222, series 1, box 1, DPA.

Miniaturizing Patents

In the late 1950s, discussions over microfilming patents resurfaced after the medium had broadened its media-technological conditions.[66] In addition to its utility for record preservation, another attribute of microfilm attracted patent offices. Amid space and paper crises, according to one patent barrister, "the real problem with patent specifications was that there were an awful lot of them."[67] Patent documentation suffered from the fragile quality of paper along with the sheer quantity of it. Microfilm was not only a means of paper preservation but also a way to reduce paper use. The claim was that it could reduce paper to about 2 percent of its original volume. Bureaucratic institutions like patent offices were seduced by this promise. Microfilm in its different physical forms—jacket, roll, fiche, and card—became commonplace in patent offices, and its role upgraded from storage space to actual office practice. This upgrade occurred despite the ongoing practical difficulties that Rebecca Lemov has described: "Much as it was a savior, microfilm continued to disappoint because it was hard to catalog and search on the fly or, really, at all."[68]

Still, the shifts, attempts, and managerial decisions to miniaturize information and reduce patent paperwork resulted from other motives, chief among them patent offices' attempts to cut costs and decentralize their operations.[69] The portable character of microfilm actually greatly facilitated the decentralization of offices and the creation of patent centers (or libraries).[70] At the time, some scholars expressed concerns over the security risk of reproducing patent information in pocket-sized material.[71] And yet, because copies of patents granted and applied for could be microfilmed, many patent offices, instead of sending out patent gazettes, directed reels regionally to their centers and internationally to other patent offices.[72] The establishment of

66. Assistant Commissioner Maurice A. Crews to Commissioner Robert C. Watson, August 17, 1959 ("Decisions as to policy regarding security and dissemination of technical information available from patents"), box 6, General Reports, Simon Newman Papers, UM.

67. Aubrey, "Discussion," 314.

68. Lemov, *Database of Dreams*, 88, 70–94 (on the relationship between microfilm, storage, and miniaturization).

69. "Annual Report of the Commissioner of Patents, Fiscal Year 1961," *Journal of the Patent Office Society* 44, no. 9 (1962): 598.

70. "Report on Information Policy," submitted by the Subcommittee on Patent and Information Policy of the Advisory Committee on Federal Policy on Industrial Innovation, December 15, 1978, box 7, Writings, Simon Newman Papers, UM. Also: Holmes, "U.S. Patent Office Modernizes."

71. Hill, "National Reference Library," 109.

72. "Obtaining Information from Patents: Patent Office Classification and Search Services," U.S. Department of Commerce, Washington, D.C., March 1960, 2, box 26, folder U.S. Patent Office, 1946–70, Dorothy M. Crosland Papers, GTA.

APRIL
2023
VOL. 64

satellite patent collections for use by the public at various locations became a reality when patents were microfilmed.[73]

As a medium, microfilm did more than simply facilitate a more equitable geographic distribution of patents for public access, it fostered the development of new, decentralized ways of reading them.[74] But microfilm's potential for reproducibility—key for widespread dissemination and for developing patent networks and centers—also prompted unexpected challenges. One of the difficulties with spreading patent information was its self-referential character, which rapidly precipitated discussions over rights that could be either infringed or acquired after accessing microfilms. Ironically, the question facing some courts was whether patent applications on microfilm constituted "prior art."[75] This issue was important because some domestic patent statutes expressly noted that only "printed publications" could destroy novelty. Because microfilms were becoming so central to the system, the meaning of "publication" was questioned. As Mario Biagioli has argued, the shift from privileges to patents meant a dramatic change in the meaning of publication.[76] Thus, microfilm posed a further challenge to the meaning of publication and prior art, showing their increasing centrality in patent operations inside and outside the office. It converted patents into precursors of the information explosion to come.[77] In other words, the consideration of whether a microfilm was sufficiently accessible to the public expanded the notion of a printed publication and the definition of prior art in patent law. That is to say, searches conducted on microfilmed patents could often reveal prior art that a preliminary search at the patent office did not reveal.

By the late 1950s and throughout the 1960s, experiments with microfilms in patent offices were ubiquitous.[78] The technology had reached the Library of Congress and many reading rooms in patent offices across the world. These reading rooms where microfilms proliferated gave a different form

73. Maurice A. Crews, assistant commissioner, to James Henley Crosland, Georgia Institute of Technology, February 10, 1960, box 26, folder U.S. Patent Office, 1946–70, Dorothy M. Crosland Papers, GTA.

74. "News from Member Libraries," Pittsburgh Regional Library Center Newsletter, no. 28, July/August 1975, 7, Deputy Director's Office Collection, CLP.

75. On the cases that came to court after World War II: In re Tenney, 254 F. 2d 619, 117 USPQ 348 (CCPA 1958); ICE Corporation v. Armco Steel Corporation, 250 F. Su 738 (1966); Philips Elec. and Pharmaceutical Industries Corp. v. Thermal and Elec. Industries, Inc., 450 F. 2d 1164, 1169 (3d Cir. 1971).

76. Biagioli, "Patent Republic," 1148.

77. Edwin L. Reynolds, acting commissioner, to James L. Wood, Chemical Abstract Services, August 28, 1962, box 161, Commissioner's Subject Files, 1925–66, record group 241, NARA.

78. Robert C. Watson, commissioner of patents, to Edward Phinney, March 30, 1960, box 205, Commissioner's Subject File 9, record group 241, NARA. Also: "Berichte der 10. Jahrestagung des Ausschusses für Patent Documentation," Vorträge, gehalten auf der 10, Jahrestagung des Ausschusses für Patent Documentation am 9/10 Mai 1968, GPOA.

FIG. 2 Edward J. Brenner, U.S. commissioner of patents when microfilms were introduced, reviewing the microfilm form to be used in the U.S. Patent Office, 1960. The step of reducing paper documents to microfilm contributed to three objectives in documentation: miniaturization, decentralization, and standardization. (Courtesy of UM.)

to the patent "bargain." In fact, they brought on board different publics for patents. Once applications were microfilmed and reading rooms equipped with machines to read and print the images, individual and corporate readers soon saw patent information as a valuable resource. Copies could be made on the spot or rolls acquired without delay, nuisance, or complication. As such, patent information could be organized in different ways to cater to different markets or publics, such as patent departments, agents, and scientists. For instance, thanks to the implementation of microfilming, the U.S. Patent Office reported that it was providing seven thousand copies of patents a day in the 1960s and twenty thousand a day in the following decade.[79] Microfilm's impact on broadening the community of readers came from the advantages of miniaturizing patent materials, making them more accessible and more quickly transmissible than before (see figure 2).

79. L. L. Lawrence, "Total System Design: The U.S. Patent Office," n.d., box M5, folder 14, National Microfilm Association, UM. Also: Shakman, Memorandum for the Members of the Micrographic Industry, September 15, 1977, box 7, General Correspondence (1977–78), George H. Harmon Papers, UM.

APRIL
2023
VOL. 64

By the mid-1960s, patent offices were preparing for a system that "will result in the future in better service to the public and reduced costs in supplying copies of patents from microform."[80] According to Edward J. Brenner, the U.S. commissioner of patents from 1964 to 1969, it would also establish the future system of classified sets of U.S. patents in microform for use by the patent office as well as the public. However, microfilm activities did not initially cover the entire patent file; they were often limited to a specific type of document: patents already granted. In other words, microfilming did not usually extend to the earlier stages like patent applications because it was deemed an inconvenient medium without proper equipment.[81] Microfilming did not become part of the operations for institutionalizing or examining an invention. By distinguishing between grant and application, the first use of microfilm in patent offices was restricted both temporally and spatially within the office's internal workings. This consideration is nevertheless interesting for scholars today because it is a reminder of the distinction in patent archival material.[82] After World War II, microfilm activities initially covered patent records but not yet patent files.[83] However, constant reference to them in plans to automate and mechanize operations shows that the agency of microfilm was becoming increasingly prominent in patent offices, and presages that microfilm would ultimately affect the very definition of patent files.[84]

Standardization

Microfilms maintained a special relationship with patents as documents. Their photographic nature inaugurated a new sense of copying not the inventions but the actual specifications of the patents, allowing easy production of certified copies. Furthermore, microfilms helped to automate, speed up, and enhance patent operations. The technology enabled offices to quickly share copies of their patents with other countries. Standardization and automation became salient issues in patent offices around the world as a result of the circulation of patent information in the second half of the twentieth century, mainly through microfilm activities. An international group of experts, ICIREPAT, was formed in the early 1960s to create information systems that handled and searched for patent applications.[85] ICIREPAT, which stood

80. Brenner, "Patent Office Plans," 156.

81. "Microfilm," *Journal of the Patent Office Society* 24, no. 12 (1942): 870.

82. John A. Marzall, "Establishment of a Microfilm Section," Commissioner's Administrative Order no. 28, May 21, 1951, box 8, file 11, record group 241, NARA.

83. C. E. Haglund to Caspar W. Ooms, commissioner of patents, June 21, 1951 (on microfilming of patents and preservation of patent copies), box 8, file 11, record group 241, NARA.

84. "How to Obtain Information from United States Patents," U.S. Department of Commerce, Washington D.C., 1964, 12, box 205, file 9, record group 241, NARA.

85. Also: Pfeffer, ed., *Information Retrieval among Examining Patent Offices*, iii–v.

for Committee for Information Retrieval among Examining Patent Offices, was administered by the United International Bureaux for the Protection of Intellectual Property (now the World Intellectual Property Organization). This group was instrumental in coordinating international efforts to achieve uniformity of patent practices.

The international standardization effort facilitated the upsurge of interest in microfilm. One of the constraints of microfilms was the different modalities that patent offices used, which hindered the international exchange of patent copies. Aperture cards, a very specific microform technology, emerged as the standard for patent offices, which began issuing them, converting copies of patents into exchange cards for novelty search purposes (see figure 3).[86] The advantage of microfilm inserts in cards over reels was that cards could now both record the reduced image of a document and code index entries or patent selection criteria.[87] The punched codes in the cards made it possible to select specifications of interest for automatic display.[88] These microcards or microfiches were a crucial means to form international and regional patent networks.[89]

While international collaboration was driven by patent offices, private companies contributed to their infrastructure as well. Film and cards were purchased from commercial sources and private companies like Kodak or its subsidiary Recordak, which became involved in patent microfilming projects around the world.[90] The rising importance of these cards was such that even patent agents used them to handle their clients' patent work.[91] This new mode changed the way that patent agents obtained patent material and how they carried out their work. What made microfiches and aperture cards particularly attractive for patent agents and searchers was that they helped to transcend the physical location of the patent office. By shifting the space and time of patent search activities, they enabled outside entities to search for any classification and make a complete numerical check "in their own office."[92]

86. R. A. Carnell, Patent Office, London, to P. J. Sibley, Recordak division, Kodak Ltd., June 14, 1967, BT 296/251, TNA. Also: "U.S. Patents on Microfilm," *The Office: Magazine of Management, Equipment, Methods* 64, no. 2 (1966): 142.

87. Some of these characteristics were already emphasized: "Mini Cards: A project under development at Eastman Kodak Company, May 1953 (revised March 1954)," box 90, General Correspondence, Patent Office, 1943–54, VBP.

88. "3¼ Million U.S. Patents to Go on Microfilm," *Panorama* 1, no. 2 (1966): 2, box 204, file S7, record group 241, NARA.

89. "International Patent Document Service," report by the International Bureau, 7, Interim Committee for Technical Cooperation—Standing Sub-Committee, April 6 to April 7, 1972, PCT/TCO/SS/II, Geneva, WIPO.

90. Van Oot, "Patents and Patent Guides," 10.

91. R. Carnell, U.K. Patent Office, report for Micro-Film Study-Group, November 22, 1968, BT 296/ 253, TNA.

92. Patterson to Coe, May 25, 1938, box 8, file 11, record group 241, NARA.

APRIL
2023
VOL. 64

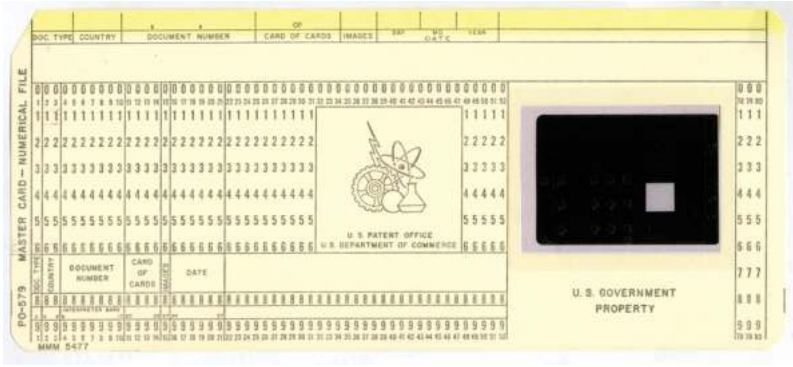

FIG. 3 Sample of a U.S. patent on microfilm in apertured card format, 1960s. Aperture cards were electric accounting machine cards with a window to accept a piece of microfilm. These cards were the best patent documentation solution because they combined index cards and microfilms by inserting a microfilm image into a hole, or "aperture." They became the international standard between patent offices. (Courtesy of TNA.)

Examining with Microfilms

By the late 1960s, microfilm had become part of the administrative machine of patent activities, fulfilling reference, copy, and search demands.[93] By then, all patents issued at the U.S. Patent Office were on microfilm. The new policy produced a complete set of indexes covering original classifications and cross-references "so that legal and research personnel would not have to write to Washington for classification check lists when conducting prior art searches."[94] In dealing with requests for copies, microfilming also changed patent office routine procedures. Orders for copies of patents were increasingly made from microfilm or aperture cards. Thus, a patent document running to as many as eight pages was reduced to a 2-inch rectangle of 35 mm film mounted in a punched card.[95] Microfilming also had the potential to transform the examination phase of patents. The patent office started to consider microfilm facilities as an essential part of the patent examination process. According to some commentators, after modernization plans took effect in patent offices, the value of microfilm extended beyond the mere

93. American Bar Association, "Patent Office Affairs," 117.

94. David R. Wolf, "Microfilm: New Tool for Retrieval and Storage of Scientific Data," *Research/Development* (June 1962): 36, box 11, Periodical Literature, 1959–85, George H. Harmon Papers, UM.

95. R. F. Smith, "A Long Journey and Small Step: A Progress Report on the Conversation of the United States Patent File to Microfilm," First International Industry Patent Conference, June 8, 1967, 9, Kodak Speech File, Kodak Historical Collection, no. 003, UR.

reduction of patent records; the real savings came from its use as a tool to simplify and advance all patent operations and routines.[96]

The U.S. government began to assess the changes that microfilming had brought and its potential application to the specific problems involved in examining patents. In 1968, the National Bureau of Standards published two studies on patent examiners' reactions to using microfilm in their everyday activities.[97] Microfilm had already been acknowledged as a popular medium for storage, retrieval, and processing of patent files. However, it was also expected to solve a significant problem: the dispersion of reference material that threatened patent "file integrity" both in the search room and at the examining divisions.[98] When examiners and searchers performed thorough patent searches, patent files "in use" were not available for others to consult. In other words, both the examiner and the searcher had to explore areas remotely from their desks. Microfilms became key for designing circulation policies that would alleviate such usage problems, as they allowed simultaneous use of patent files (see figure 4), making it practical "to let each examiner have [their] own individual file of the patent classes assigned to [them]."[99] Today, knowing the potential status of an application may sound like a naive and obvious characteristic of patent routines, but at the time, it was a significant breakthrough.

The National Bureau of Standards went even further and looked at the impact of film polarity on patent examiners. Such interest was prompted by patent personnel's reluctance to change how the office operated. The bureau conducted two studies over a period of four months. The first, involving twelve examiners from the mechanical unit, was a pilot study considering the effect of positive or negative film polarity on examiners' search time. The second study, involving thirty examiners from the mechanical, chemical, and electrical units, assessed the preference for positive or negative film.[100] Aiming to evaluate human–machine interaction, the researchers first recorded how many seconds it took examiners to locate reference numbers in the microfilm. They then attempted to measure examiners' eye fatigue while scanning microfilmed patent applications.[101] Despite initial hesitation to

96. Hurd, "Patent Copy Document System." Also: Ethan A. Hurd to J. Henley Crosland, June 8, 1967, box 26, folder U.S. Patent Office, 1946–70, Dorothy M. Crosland Papers, GTA.

97. Gail A. Bloch, George G. Gentry, and Juanita V. Field (supervised by Dr. June R. Cornog), "Two Studies of the Effect of Film Polarity on Patent Examiners' Performance," Institute for Applied Technology, National Bureau of Standards, Washington, D.C., 1968, box M1, folder 74, National Microfilm Association Records, UM.

98. Urbach, "Future Microsystem."

99. Smith, "Long Journey and Small Step," 12.

100. Louis J. Zeh, Xerox Corp., to Vernon D. Tate, May 31, 1968, box C10, folder 4, National Microfilm Association Records, UM.

101. Eye strain had already been identified as a problem related to the legibility and readability of patent and trademark applications, which prompted specific patent printing policies—for instance, that sections of applications were to be printed in larger or in

APRIL
2023
VOL. 64

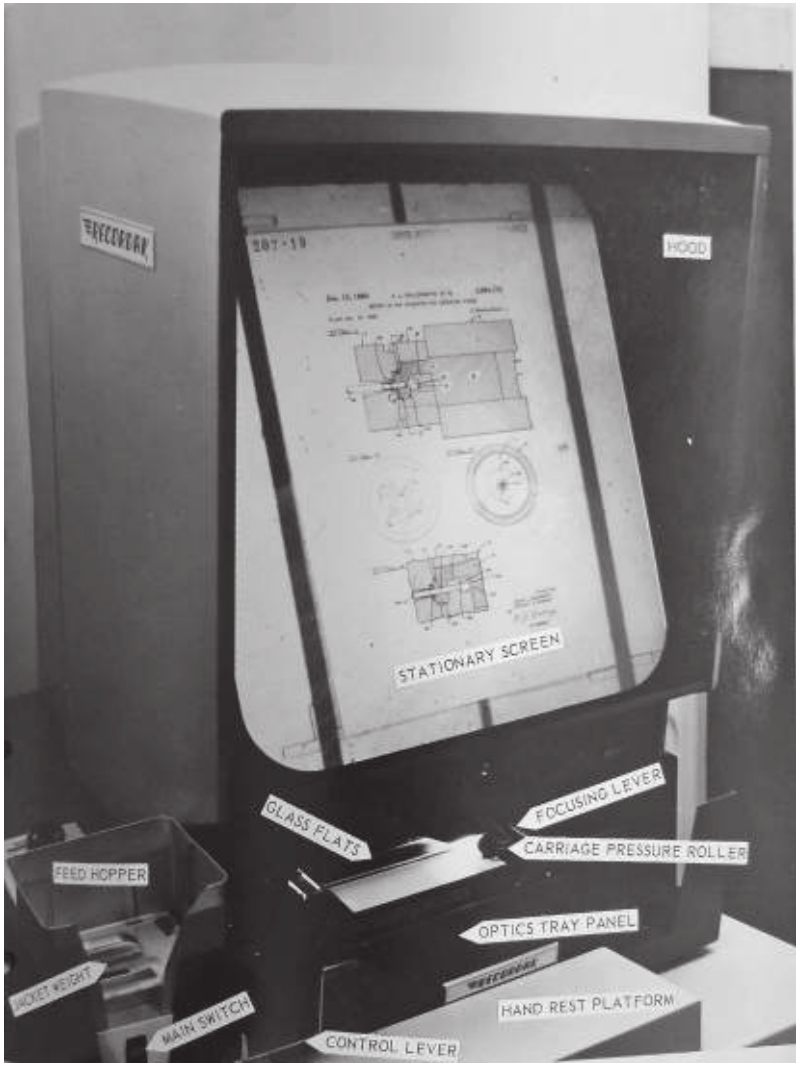

FIG. 4 Experiments with microfilm viewing apparatuses in the U.S. Patent Office at the end of the 1960s. This picture shows one of the apparatuses installed in the U.S. Patent Office, a Recordak microfilm viewing apparatus, whereby the reader projected the first page of the patent onto the screen and a sliding lever permitted the operator to view subsequent pages. Twelve of these apparatuses were installed in the U.S. Patent Office. (Courtesy of NARA.)

conduct these experiments, the patent examiners demonstrated a remarkable capacity to grasp the materiality of patents as documents and the potential benefits of microfilm for examination procedures. The results demonstrated how the quest for search proficiency revealed the specific characteristics of the typical reading situation when examining patents—particularly how light interacted with matter and the speed of document retrieval.

The links between legibility and patent examination might not always be apparent. Patent examination depends on how an examiner would read a specification, and evidence of the importance of this task can be found in the emphasis that patent offices put on second readings, proofreading, and the need to avoid errors when specifications go to print.[102] These operations are often eclipsed by the interpretative (technical, mechanical, chemical, or scientific) grid or by the emphasis on other activities when taking out a patent, mainly drafting the application. But interestingly, microfilms affected the examining activity—that is, the way patent examiners could read the material—shifting the manual and traditional methods to an optical medium that relied on character recognition systems to retrieve, search, and analyze applications.[103]

This modification was arguably microfilm's main benefit, but it challenged the established practice of assembling an application. The file wrapper was a paper tool that documented the examiner's various activities in conducting a patent application.[104] It was an important part of the notation system for routine search and examination procedures that enabled examiners to highlight issues, make annotations and inscriptions, provide references, and incorporate communications with applicants.[105] In order to minimize the disruption to traditional examining procedures and placate initially reluctant patent examiners, two designs were proposed. Microfilm jackets afforded some space for note-taking practices to continue, albeit in a reduced form.[106] Additionally, the first page of the patent document could retain its indexical character, and the viewer would have a "key frame" jump that simulated

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boldface type and with a generous spacing of letters. Chas R. Allen to Conway P. Coe, May 6, 1935, box 8, file 11, record group 241, NARA.

102. R. H. Herrell, administrative assistant to the public printer, to the commissioner of patents, December 2, 1939, box 8, file 11, record group 241, NARA.

103. Dienner, "Simplifying the Examination," 79.

104. "Requirement of the Patent Office Amenable to Automation," report to the commissioner of patents, National Bureau of Standards, Institute for Computer Sciences and Technology, January 1973, box 6, General Reports, Simon Newman Papers, UM.

105. Glascock, "Amendments," 633. On the British practice: Blake, "British Patent System."

106. "A Patent Copy Document System," U.S. Proposal, no. C-666-66, U.S. Department of Commerce, November 1965, box 204, file S7, record group 241, NARA.

APRIL
2023
VOL. 64

turning the pages from one patent to another, requiring an indication on the microform for the display apparatus to sense the patent's first page.[107]

Microfilming not only questioned bureaucratic routines, it also changed the patent office's image in the outside world, opening up new ways of viewing patents for applicants as well as for those doing patent searches and commercial research. According to commentators, many of these technical problems could be solved (and initial hostilities overcome) by changing the features of viewing equipment to better meet the needs of the examiners or searchers using it.[108] In other words, the patent office could become a sort of laboratory, and the imaginative options available for microfilming patent files could go even further than the existing system with printed patents. One suggestion was for a projection selector with an instant push button so that individual pages could appear simultaneously, enabling immediate comparison and searches. A specific screen brightness was also recommended, along with an appropriate office environment and viewing equipment with optional angles so that the examiner or searcher could easily adjust images. In short, the new technology to read patents would attract both examiners and searchers, hopefully dispelling their frustration and initial hesitation. Perhaps the most interesting feature of this equipment was that it incorporated not only a capacity to quickly locate patents but also the possibility to copy desired pages.

Information entrepreneurs may have dismissed these early attempts to automate the patent office as primitive. However, the endeavors were innovative in developing management tools and creating an information environment that resembled the current patent system. They signaled the advent of an "on-demand," fast copy production system amid significant pressure to make files readily available to the public. This was also the historical moment when glimpses of an incipient information industry emerged, repackaging patent information to provide "value-added" or user-friendly services. At last, patents began to be perceived as a form of mechanized information, a step before their conversion into data.[109]

In the mid-1970s, the proportion of microfilming in patent offices across the world was not as high as anticipated—probably due to the limitations and costs involved in installing microfilm equipment for public use.[110] The technology had become part of patent activities, but it was still mainly a

107. "Patent Copy Document System," U.S. Proposal, no. C-666-66, 77, November 1965, box 204, record group 241, NARA.

108. Lewis E. Walkup to Phil M. Dunson, Battelle Memorial Institute, March 6, 1968 in U.S. Congress, Senate Committee on Labor and Public Welfare, 90th Cong. (1968), 2608–9.

109. Hill, "National Reference Library," 109.

110. "Patent Information Study Team in Europe and America," report by Japan Patent Association, Derwent, London, 1976, 28, MYHS/3/1/6, MYHS.

means of storage or reproductive technology to improve file security.[111] While not successfully delivering all it promised, microfilm nevertheless facilitated what was a remarkable achievement: the elucidation of patent documentation's photographic properties. In doing so, it acknowledged the possibility to expedite and automate patent operations, to make and use searches and abstracts outside the office, and to allow information brokers to provide distinct material devices to access patents in multiple forms, instigating a market for patent information products.[112] These intermediaries saw themselves as service providers, not as the owners of patent information. After patents had been converted into microfilms, studies about the performance of patent systems proliferated, enabling usage of files to be reported, analyzed, and systematized. The feasibility of these studies was connected to how patent files had already become subjected to mechanical operations by the very same technology that changed their status and function. Consequently, patent offices soon came to be evaluated in terms of efficiency. The valuation procedures for processing and administering them shifted to their statistics.

Conclusion

Microfilming is explored here both as a means to reproduce patents and as a distinct way to consider patent history. According to Brad Sherman, "patent history is a subject that is still largely waiting to be written."[113] One of the difficulties in writing this history stems from the entangled relationship between documentation and communication. What would the history of patents look like if, instead of tracing inventors and scientific or technological developments, it focused on patents as technological artifacts or tools of documentation and communication in their own right? Such a history would appreciate how patents have been written, numbered, read, and reproduced historically, as well as the diverse paths taken to sort, store, circulate, copy, and sell them. It would focus on the peripheral to explore the many ways that patents have been (or could be) coded for searches, retrieval, examination, observation, and/or litigation. It is therefore important to question not only how patents became documents but also how they became information. Media effects precipitated the way such views of patents emerged. As Alain Pottage has noted, "inventions were first communicated in the form

111. "Requirement of the Patent Office Amenable to Automation," Report to the Commissioner of Patents, National Bureau of Standards, Institute for Computer Sciences and Technology, January 1973, box 6, General Reports, Simon Newman Papers, UM.

112. Monty Hyams, "How to Profit from Information Technologies," *Information Services and Use* 7 (1987): 145–52, GB 2107, MYHS/1/3/16, MYHS.

113. Sherman, "Towards a History," 3.

APRIL
2023
VOL. 64

of models."[114] The shift from models to paper was the historical key to the invention of the "patent specification," a "paper item" that constituted the driving force behind modern patent regimes.[115] The agency of paper and stationery was—and still is—central to many operations around patent law. Some people can recall how devices such as colored clips characterized domestic patent offices.[116] Indeed, when the librarian of the British patent office talked about organizing and handling patents, he highlighted the importance of "paperkeeping."[117]

What, then, is the place of microfilms in patent history? Microfilms were crucial for saving space in patent offices. They were also a means of measuring examination time and modifying the space for patent searches. Significantly, they facilitated the circulation and dissemination of patents regionally and internationally, increasing their value beyond mere documents. But microfilm's impact was subtler than just its utility as a tool for information storage and retrieval. It brought to light what was perhaps not visible on the surface. It allowed patent documents to be photographed, abstracted, and circulated for different purposes outside national patent offices. The normalization of patent copies circulating across borders created an information environment that facilitated computer-based patent systems in the making. That process gradually transformed patents into transferrable data. In that sense, pilot microfilm schemes ushered in and facilitated an industry based on information about patents. It is no coincidence that this industry was particularly interested in lists, indexes, and abstracts as vehicles linking the photographic dimension of microfilms, in turn changing our view of patents as data that can be systematized, analyzed, and disseminated.

Jose Bellido is reader in law at the University of Kent in the United Kingdom. His research interests include intellectual property, legal history, and evidence. This research was funded by the European Union's Horizon 2020 research and innovation program (grant no. 741095-PASSIM-ERC-2016-AdG). The author would like to thank Eva Hemmungs Wirtén and all PASSIMers, Ross Carder, John Maher, and the *Technology and Culture* reviewers.

Bibliography

Archival Sources

Carnegie Library of Pittsburgh Archives and Special Collections, Pittsburgh, Pennsylvania, U.S.A. (CLP)

DuPont Archive, Hagley Museum and Library, Wilmington, Delaware, U.S.A. (DPA)

Georgia Institute of Technology Archives, Atlanta, Georgia, U.S.A. (GTA)

114. Pottage, "Law Machines," 624.
115. Biagioli, "Patent Republic," 1143.
116. Harman, "Patents and Information," 98.
117. Hill, "National Reference Library of Science and Invention."

German Patent Office Archives, Munich, Germany (GPOA)
India Office Records and Private Records, British Library Archives and Manuscripts, London, U.K. (IOR)
Modern Records Centre, University of Warwick, Warwick, U.K. (MRC)
Monty Hyams Archive, City University, London, U.K. (MYHS)
National Archives, Kew, U.K. (TNA)
National Archives and Records Administration, College Park, Maryland, U.S.A. (NARA)
Science Institute Archives, Philadelphia, Pennsylvania, U.S.A. (SIA)
Special Collections Research Center, University of Michigan, Ann Arbor, U.S.A. (UM)
Special Collections, Rush Rhees Library, University of Rochester, Rochester, New York, U.S.A. (UR)
Vannevar Bush Papers, Library of Congress, Washington, D.C., U.S.A. (VBP)
World Intellectual Property Organization, Geneva, Switzerland (WIPO)

Published Sources

American Bar Association. "Patent Office Affairs." ABA Section of Patent Trademark and Copyright Law, *Committee Reports* (1969): 117.
Aubrey, John M. "Discussion on Lord Eccles' The Communication Problem." *CIPA Journal* 3, no. 9 (1974): 312–14.
Auerbach, Jonathan, and Lisa Gitelman. "Microfilm, Containment, and the Cold War." *American Literary History* 19, no. 3 (2007): 745–68.
Barnett, Claribel R. "The Bibliofilm Service of the U.S. Department of Agriculture Library." *Agriculture Library Notes* 11 (1936): 57–60.
Biagioli, Mario. "Patent Republic: Representing Inventions, Constructing Rights and Authors." *Social Research* 73, no. 4 (2006): 1129–72.
Blake, John L. "The British Patent System." *Journal of the Patent Office Society* 20, no. 4 (1938): 337–50.
Brenner, Edward J. "Patent Office Plans, Program and Progress, August 6, 1966." In *Patent, Trademark and Copyright Law: Summary of Proceedings, Montreal, Canada*, edited by Edward C. Vandenburgh, 155–59. Chicago: American Bar Center, 1967.
Bush, Vannevar. "As We May Think." *Atlantic Monthly*, March 1945, 101–8.
Bush, Vannevar. "Some Proposals for Improving the Patent System." *Journal of the Patent Office Society* 39, no. 1 (1957): 11–61.
Davis, Watson. "Microfilms Make Information Accessible." *Special Libraries* 29 (1938): 35–36.
Dienner, John A. "Simplifying the Examination of U.S. Patent Applications." *Journal of the Patent Office Society* 45, no. 2 (1963): 79–96.
Dommann, Monika. *Authors and Apparatus: A Media History of Copyright*. Ithaca: Cornell University Press, 2019.
Frumkin, Max. "The Early History of Patents for Invention." *Transactions of the Chartered Institute of Patent Agents* 66 (1947–48): 20–51.

Gimbel, John. *Science, Technology, and Reparation: Exploitation and Plunder in Postwar Germany*. Palo Alto: Stanford University Press, 1990.

Gipe, George A. *Nearer to the Dust: Copyright and the Machine*. Baltimore: Williams and Wilkins, 1967.

Glascock, Eustace Straughn. "Amendments." *Journal of the Patent Office Society* 16, no. 8 (1934): 633–41.

Harman, Michael G. "Patents and Information." *CIPA Journal* 6, no. 3 (1976): 95–105.

Hemmungs Wirtén, Eva. "How Patents Became Documents, or Dreaming of Technoscientific Order, 1895–1937." *Journal of Documentation* 75, no. 3 (2019): 577–92.

Hill, Michael W. "The National Reference Library of Science and Invention." *CIPA Transactions* 88 (1969–70): 105–21.

Holmes, James R. "U.S. Patent Office Modernizes Its Files with a Microfilm System." *The Office: Magazine of Management, Equipment, Methods* 72, no. 4 (1970): 110–12.

Hurd, Ethan A. "The Patent Copy Document System." In *Proceedings of the Sixteenth Annual Meeting and Convention of the National Microfilm Association*, edited by Vernon D. Tate, 117–23. Annapolis: National Microfilm Association, 1967.

Jansen, Jon B., and Stefan Weyl. "Spy at Work: Underground Movement in Germany." *Atlantic Monthly*, February 1943, 71–77.

Kang, Hyo Yoon. "Ghosts of Inventions: Patent Law's Digital Mediations." *History of Science* 57, no. 1 (2019): 38–61.

Lehman, Milton. "Wizards of the Basement Workshop." *Nation's Business* 38, no. 2 (1950): 38–40.

Lemov, Rebecca. *Database of Dreams: The Long Quest to Catalog Humanity*. New Haven: Yale University Press, 2015.

Lindström, Matts. "Drömmar om det minsta. Mikrofilm, överflöd och brist 1900–1970" [Dreams of the smallest: Microfilm, scarcity, and abundance 1900–1970]. Ph.D. diss., Stockholm University, 2017.

Ooms, Caspar W. "What Should Be Done to Make Our Patent System More Effective in the Accomplishment of Its Intended Purpose?" *Journal of the Patent Office Society* 28, no. 1 (1946): 5–17.

O'Reagan, Douglas Michael. "Science, Technology, and Know-How: Exploitation of German Science and the Challenges of Technology Transfer in the Postwar World." Ph.D. diss., University of California, Berkeley, 2014.

Peiss, Kathy. *Information Hunters: When Librarians, Soldiers, and Spies Banded Together in World War II Europe*. Oxford: Oxford University Press, 2020.

Pfeffer, Harold, ed. *Information Retrieval among Examining Patent Offices*. Washington, DC: Spartan Books, 1964.

Pottage, Alain. "Law Machines: Scale Models, Forensic Materiality and the Making of Modern Patent Law." *Social Studies of Science* 41, no. 5 (2011): 621–43.

Price, Miles O. "The Microcard Foundation." *ABA Journal* 39, no. 4 (1953): 304–5.

Seidell, Atherton. "The Utilization of Microfilms in Scientific Research." *Science* 89, no. 2298 (1939): 32–34.

Sherman, Brad. "Towards a History of Patent Law." In *Intellectual Property in Common Law and Civil Law*, edited by Toshiko Takenaka, 3–18. Cheltenham: Edward Elgar, 2013.

Tate, Vernon D. "Microphotography in Wartime." *Journal of Documentary Reproduction* 5, no. 3 (1942): 129–38.

Urbach, Peter. "A Future Microsystem for the U.S. Patent Office." In *Proceedings of the Eleventh Annual Meeting and Convention*, edited by Vernon D. Tate, 11:153–61. Annapolis: National Microfilm Association, 1962.

Van Oot, James G. "Patents and Patent Guides on Microforms." *Journal of Chemical Documentation* 10, no. 1 (1970): 9–13.

Vismann, Cornelia. "Jurisprudence: A Transfer Science." *Law and Critique* 10, no. 3 (1999): 279–86.

Wilds, Thomas. "Information Retrieval." *American Archivist* 24, no. 3 (1961): 269–82.

Zachary, Gregg Pascal. *Endless Frontier: Vannevar Bush, Engineer of the American Century*. Cambridge, MA: MIT Press, 1999.

Zurkowski, Paul G. "Post-Gutenberg Copyright Concepts." *National Microfilm Association Journal* 2, no. 2 (1968): 70–73.