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THE SEMICONDUCTOR CHIP PROTECTION ACT OF 1984

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Mr. THURMOND, from the Committee on the Judiciary, submitted the following

REPORT

[To accompany S. 1201]

The Committee on the Judiciary, to which was referred the bill (S. 1201) with respect to the protection of semiconductor chip products, having considered the same, reports favorably thereon with an amendment in the nature of a substitute and recommends that the bill as amended do pass.

I. PURPOSE

The semiconductor chip lies at the base of American industrial efforts in high technology fields. This marvel of modern technology is the starting point for dozens of new industries, including some that are highly competitive in world markets. In the semiconductor industry, innovation is indispensable; research breakthroughs are essential to the life and health of the industry. But research and innovation in the design of semiconductor chips are threatened by the inadequacies of existing legal protection against piracy and unauthorized copying. This problem, which is so critical to this essential sector of the American economy, is addressed by the Semiconductor Chip Protection Act of 1984.

The purpose of S. 1201 is to amend Title 17 of the United States Code with respect to the protection of semiconductor chip products. Specifically, S. 1201 would amend Title 17 by creating a new type of copyrightable work—"mask works"—and by making it unlawful to copy such works or to make or distribute semiconductor chip products that embody copied mask works.

The Semiconductor Chip Protection Act of 1984, S. 1201, would prohibit "chip piracy"—the unauthorized copying and distribution of semiconductor chip products copied from the original creators of such works. A more detailed analysis of the proposed law is found below in the section-by-section analysis of the bill.

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II. Technological Background

A. SEMICONDUCTOR CHIP PRODUCTS

Semiconductor chip products, or "chips," are small pieces of semiconductor material [1] that perform electronic functions. A chip is composed of layers of semiconductor material (which has been "doped" in places with traces of other elements, such as boron, phosphorous, and arsenic), insulating material, and metal. These layers comprise a complex "sandwich" capable of performing the same functions as many transistors, resistors, and capacitors wired together. Indeed, some chips can perform functions that would have required a room full of electronic parts 30 years ago. A chip of the size about 0.2 inch x 0.2 inch may contain more than 100,000 transistors. *See The Semiconductor Chip Protection Act of 1983: Hearing on S. 1201 Before the Subcomm. on Patent, Copyrights & Trademarks of the Senate Comm. on the Judiciary*, 98th Cong., 1st Sess. at 64, 68 (hereafter "*Hearings*").

There are two principal types of chips: microprocessors and memories. The former is a computer on a chip. Microprocessors can serve as the "brains" of computers and many other commercial devices, such as chemical process controllers, microwave ovens, robots, automobile ignition controllers, hand-held calculators, and word processors. *See Id.* at 68–69. Memories store information for use in computers, data bases, and the like. *Id.*

B. DEVELOPMENT OF SEMICONDUCTOR CHIPS

Several distinct stages are involved in bringing a new semiconductor chip product to the market. Initially, market studies are made to determine the physical and electrical characteristics for which there will be a market demand. Logic and circuit diagrams to implement the desired characteristics or product specifications follow. Next comes a long stage of layout determination, which involves repeated iterations of local and overall three-dimensional layout designs to implement the selected electrical circuitry. The goal of these iterations is to settle on a three-dimensional layout that includes a predetermined collection of parts or building blocks. The layout must be as compact as possible, and must be compatible with manufacturing technology, so that a high output yield of properly functioning chips may be attained. This process involves a number of trade-offs, and trial and error is usually the method for choosing the economically optimum layout. *See Hearings* at 72–73.

The layout stage is followed by the actual manufacturing process. This is the point at which the production provided by S. 1201 would become important.

C. DESCRIPTION OF SEMICONDUCTOR CHIP MANUFACTURING PROCESS

The predominant technology for manufacturing semiconductor chip products today uses a process known as photolithography or

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[1] Semiconductor materials are elements or compounds that partially conduct electricity. They are intermediate between conductors, which fully conduct electricity, and insulators, which do not appreciably conduct electricity. Semiconductors in use at this time in the United States include silicon, germanium, and gallium arsenide.

"masking." As the latter name suggests, the process uses masks, which are a kind of stencil, in the manufacturing process.

First, a pure silicon wafer, typically a 3-inch or 5-inch disk, is prepared. Hundreds of semiconductor chips will be photoengraved onto the wafer, so that by the end of the process, the wafer will resemble a round sheet of postage stamps. The wafer is coated with a thin layer of silicon dioxide, usually by subjecting the wafer to a steam bath. The oxide layer is then coated with a thin layer of an acid-resistant substance known as "resist." The resist is typically unpolymerized rubber or synthetic rubber dissolved in a solvent. The solubility in certain solvents changes dramatically when the resist is polymerized by exposure to ultraviolet radiation. *See Hearings* at 69–71.

A mask is now placed over the coated wafer. The mask is ordinarily a glass disk with the layout pattern for one layer of the chips imprinted on it in opaque and transparent portions of the disk. Ultraviolet light is directed at the mask. The light passes through the transparent parts of the mask, where it polymerizes the resist; the light does not pass through the opaque parts of the mask, and there the resist remains unpolymerized. The wafer is then washed in solvent, which removes the unpolymerized resist and leaves the polymerized resist on the wafer, in the same pattern as the transparent portions of the mask. The wafer is then placed in a hydrofluoric acid bath, which dissolves away the portions of the silicon dioxide coating on the wafer that are not covered with resist. This leaves a hill and valley pattern on the surface of the wafer corresponding to the pattern of the mask. *See Hearings* at 70 (Fig. 1).

The manufacture of the chip typically involves 8 to 12 masking steps such as the one just described. Each step uses a different mask. In some steps, "dopants" such as boron, phosphorous, or arsenic are diffused into the silicon through "windows" etched into the silicon dioxide coating at pre-determined points. In some, aluminum is diffused into holes etched ("drilled") into the silicon dioxide coating at specific locations, so that the aluminum acts as "wires" connecting circuit elements to one another. In other steps, amorphous silicon is laid down in a particular pattern, or insulating layers are created. The culmination of these masking steps is a multilayered sandwich of silicon, silicon dioxide, aluminum, boron and phosphorous "dopants," and so on. The chips on the wafer are sawed apart and the chips are ready for final packaging in a ceramic or plastic package.

Although the preceding description is of today's predominant technology, other techniques, as well, are being developed or are in use. For example, the pictorial information—the pattern of transparency and opacity—embodied in masks can also be represented in digital form as a tabulation of coordinates of points in the mask. This is customarily done as part of the process for making the masks; the coordinates are stored in a data base tape in the form of binary signals (magnetized and unmagnetized domains on the surface of magnetic tape) which are used to control the manufacture of the mask itself. However, it is possible to omit the manufacture and use of actual physical masks, and instead to use the tape to drive a light beam directly over the resist in the desired pattern. *See Hearings* at 73–74. This process requires a greater capital investment and is much slower to use in manufacturing, but results in a more clearly defined, more compact pattern. It should

be noted that Section 106(6)(D) of Title 17, as amended by Section 4(3) of S. 1201, specifically contemplates manufacture of semiconductor chips by this technology. Furthermore, the definition of mask work in Section 101 of Title 17, as added by Section 2 of S. 1201, includes images stored in digital form in a data base tape (*i.e.*, "related images, however fixed or encoded").

Another emerging technology contemplates the use of electron beams on semiconductor material to etch the desired pattern into the material. This process, too, is covered by the provisions of S. 1201. The Committee intends S. 1201 to be sufficiently flexible to cover the foreseeable advances in photolithography and related chip manufacturing technology.

D. HOW CHIPS ARE COPIED

The technology for copying chips is well developed and relatively inexpensive in comparison with the cost of designing the chip and initially preparing masks for chip manufacture. *See Hearings* at 66, 76–77, 79–80, 84. The would-be copyist simply removes the plastic or ceramic casing; photographs the top, metal connection layer; dissolves the metal away with acid in order to photograph the semiconductor material in the next layer; and then photographs underlying layers by varying the depth of focus of the camera so that it picks up the desired layer of the translucent semiconductor material lying below.

The photographs can then be used either for purposes of analysis (which, as "reverse engineering," is legitimate in itself) or simply to reproduce copies of the masks that were used to make the original chip (which is piracy). The provisions of S. 1201 permit the former and prohibit the latter.

III. Business and Economic Impact

The semiconductor industry is an essential component of the United States economy. Semiconductor devices continue, at a phenomenal pace, to become steadily more powerful, more energy efficient, smaller and less expensive. Today, a one-quarter inch square semiconductor chip which costs under $10 has far greater capabilities than did the computers of 30 years ago that occupied whole rooms and cost millions of dollars.

Semiconductor technology has been able to provide ever less expensive and ever more powerful chips largely because the semiconductor industry has maintained an extremely high level of research and development (R&D) expenditures. In 1982, average R&D expenditures for the U.S. semiconductor industry as a percentage of sales were 10.7%. Capital investment levels as a percentage of sales were over 14%. Since the early 1970s, the U.S. semiconductor industry has grown at a rate in excess of 20% per year; during the same period, U.S. high technology industries as a whole grew at a real annual rate of 7%. The U.S. chip market in 1983 is estimated at $7 billion and the worldwide market, at $16 billion. *Hearings* at 153.

To a very large extent, the unparalleled growth achieved by the United States electronics industry over the past two decades has been due to the development of the semiconductor chip. The chip has made

possible the creation of many of the new high technology products which have paced this growth. It has led to the development of new industries. Personal computers, hand-held calculators, word processors, video games, and digital watches are but a few of the products which the rapid development of the chip has made possible.

Semiconductor chips have had a significant effect on other products as well. Today, automobiles, ovens, telephones, radios, television sets, and washing machines all contain semiconductor chips, and, as a result, are able to perform more efficiently than ever before and frequently can be sold at a lower price. By reducing production costs and increasing product quality, the semiconductor chip plays a major role in keeping a wide array of American products competitive in world markets. In addition, the use of semiconductor chips in place of manually assembled circuitry has enable U.S. businesses to relocate off-shore production facilities back to the United States.

Continued innovation in semiconductors, however, with all its desirable effects, is threatened by the piracy, or copying, of semiconductor circuit layout patterns. As chips have grown more efficient and powerful, each new development has cost more in R&D investment and man-hours. Today the development of a new family of semiconductor chips can require years to complete, demands thousands of hours of engineers' and technicians' time, and costs up to $100 million. These high fixed or front-end costs must be reflected in the price at which those semiconductor chips are sold, as firms seek to achieve a rate of return sufficient to cover past R&D and investment and provide for continued development of new products.

A pirate firm, on the other hand, can produce a perfect copy of another firm's semiconductor chip for as little as $50,000 to $100,000 for the main chip of a chip family. An entire family of chips can be copied for less than $1 million. *Hearings* at 66, 75–76, 78–79. As a result, pirate firms with no R&D investment to recoup can set their prices far lower than can the firms that have underwritten the development costs. The result is a reduction in the price at which the innovative firm can sell its chips. Often this means a loss in market share for the innovative firm. *See Hearings* at 123–126. Existing evidence indicates that annual losses due to copying can reach tens of millions of dollars for a single firm. *Hearings* at 126.

As Senator Mathias so succinctly put it in introducing S. 1201:

> High tech firms spend huge amounts of time and money producing semiconductor chips . . . yet, these innovators are being ripped off by onshore and offshore "chip pirates" . . .

129 Cong. Rec. S5992 (daily ed. May 4, 1983).

While today's more complex chips have a higher front-end cost in terms of worker-hours and dollars, the cost of chip piracy has remained substantially constant. Accordingly, the ratio of the innovators' costs to those of the pirates has risen dramatically, and the economic incentive for piracy has increased correspondingly.

As returns on investment are reduced by piracy, semiconductor chip firms have less internal capital available for new R&D and investment. Furthermore, the threat of piracy reduces anticipated returns on new investment. Together, these factors act to limit funds

available for future R&D and capital investment and create a strong disincentive to continued innovation. If such piracy continues unabated, it may make it impossible for the American semiconductor industry to continue to invest in development of new chips. When others reap where the innovator sows, needed funds for development dry up and become unavailable.

This point is amply documented in testimony before the Subcommittee on Patents, Copyrights and Trademarks. For instance, executives from two semiconductor manufacturers testified as follows:

> Senator MATHIAS. And if the piracy continues, what would be the impact on growth of the industry in the United States?
>
> Dr. LAYTON. Reduced innovation, and subsequently a reduced growth rate of the industry.
>
> Mr. DUNLAP. For every design we do today, we have to look at our return on investment in light of the pirate, and say what is going to happen to our pricing? Are we going to be able to recover our research and development costs?
>
> If it is a marginal decision, we decide not to do the product because when the pirate comes in and reduces the price, we will not recover our costs. So, we decide just not to spend the money.
>
> Senator MATHIAS. Well, then what you are saying is that this could have the effect of blighting the growth of the industry?
>
> Dr. LAYTON. Yes.
>
> Mr. DUNLAP. If we do not have the protection.

Hearings at 81.

Unless Congress acts to protect semiconductor chip designs, semiconductor firms will have an economic incentive to wait and to copy, rather than to invest in R&D and to innovate. Without adequate intellectual property protection for chips, R&D will be at an increasing disadvantage in the capital market. The industrial leadership of the American semiconductor industry in world markets may therefore vanish, unless this piracy is stopped.

IV. EXISTING LAW

The serious economic impact of chip piracy suggests that our intellectual property laws ought to provide clear and comprehensive protection against this damaging misappropriation of sophisticated technology. Unfortunately, American industry receives only limited, inadequate protection under current law.

A. COPYRIGHT PROTECTION

It is extremely doubtful that copyright law currently protects against chip piracy. Semiconductor chips are utilitarian articles which are generally not protected by copyright. As the General Counsel of the Copyright Office testified before the Subcommittee:

> Arguments in favor of protection for chips or chip design under the current Act must confront the barriers of at least

> four fundamental principles of traditional copyright law: copyright does not protect useful articles *per se*; copyright protects the design of a useful article only to the extent that it can be identified separately from, and is capable of existing independently of, the utilitarian aspects of the article; copyright in a drawing or other representation of a useful article does not protect against unauthorized duplication of the useful article; and copyright protects only expression, not ideas, plans, or processes.

Statement of Dorothy Schrader, *Hearings* at 27–28 (footnote omitted).

In accordance with the views expressed by its General Counsel in the hearings before the Subcommittee:

> The Copyright Office historically has refused, and presently does refuse, to register claims to copyright in . . . the design or 'topology' of, or imprinted patterns in, semiconductor chips, and the . . . chips themselves.

Id. at 29–30. At the very least, the availability of copyright protection for chip design is sufficiently doubtful that semiconductor manufacturers cannot invest the substantial sums necessary for research and development of new chips with any degree of confidence that they will be able to prevent, or recoup damages for, unauthorized copying of the chips.

The question has been raised whether the recent decision of the Third Circuit in *Apple Computer, Inc.* v. *Franklin Computer Corp.*, 714 F.2d 1240 (3d Cir. 1983), *cert. dismissed*, 104 S. Ct. 690 (1984), obviates the need for this legislation. Clearly, that is not the case.

The *Apple* decision involved the copyrightability of computer programs stored in machine language ("object code") in diskettes and semiconductor memory devices (so-called "read-only memory," or "ROM chips"). The court ruled, among other things, that "a computer program in object code embedded in a ROM chip is an appropriate subject of copyright." *Id.* at 1249.

This result, even if generally applied,[2] does not affect the need for S. 1201. This legislation does not address whether computer programs—or any other copyrightable works—stored in ROM chips are or should be protected under the copyright laws; rather, it directs only that the layout of chips, as embodied in mask works, should be protected under the copyright law.[3] The *Apple* decision itself recognizes this distinction, noting that "Apple does not seek to protect the ROM's architecture but only the program encoded upon it." *Id.* at 1249 n.7. The protection provided by S. 1201 neither adds to nor detracts from the protection of computer programs in ROM chips which the *Apple* case addresses.

Moreover, many chips are not designed for the storage of computer programs or of any other copyrightable work.[4] The layouts of these

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[2] The Supreme Court has never ruled on the question.

[3] If one manufacturer of ROM chips copied the layout of a second manufacturer's chip, he would not be liable under the doctrine of the *Apple* case. Conversely, Franklin could copy Apple's computer program from a ROM without becoming liable under S. 1201 (by changing the layout while preserving the stored program, or by copying the program into a different kind of ROM chip).

[4] *See, e.g., Hearings* at 78, 80 (testimony of Dr. Layton as to alleged piracy of his company's analog to digital converter chips).

chips would be protected by S. 1201, even though the principles expressed in the *Apple* decision have no application whatever to the case of such chips. Accordingly, the *Apple* decision does not solve the pressing need of the United States semiconductor industry for protection against chip piracy.

B. PATENT PROTECTION

In many circumstances, the unavailability of copyright protection for useful articles may be warranted because the patent laws can be used to obtain appopriate protection. *See generally Mazer* v. *Stein*, 347 U.S. 201 (1954); *Baker* v. *Seldon*, 101 U.S. 99 (1879). But the testimony presented to the Subcommittee establishes that, in the case of chips, patent protection is neither adequate nor always appropriate. Patent law can protect the basic electronic circuitry of a new microprocessor or other chip. But a patent does not protect the carefully developed layouts and artwork required to adapt that circuitry for a particular industrial purpose in the most economical and efficient way. It is precisely this design effort which consumes thousands of worker-hours and costs millions of dollars, but which can be copied by a chip pirate for a fraction of the cost.

Professor Arthur Miller summarized the impediments to effective patent protection in his testimony before the Subcommittee.

> For an alleged invention to qualify as a utility patent, it must be novel and not "obvious." 35 U.S.C. § 103. The Supreme Court has said that the patent clause in the Constitution, Article 1, § 8, cl. 8, mandates a high standard of inventiveness, which is codified in 35 U.S.C. § 103, and that patents cannot lawfully be granted for slight advances in technology. See *Graham* v. *John Deere Co.*, 383 U.S. 1 (1966). As a practical matter, the layout of a chip, as embodied in a mask, will rarely, if ever, satisfy this standard of invention. A chip may be the product of millions of dollars and thousands of hours effort, but it is the result of hard work, not "invention." [5]

Dr. Christopher K. Layton, the vice president of a semiconductor chip manufacturing firm, gave a practical illustration of the same point in his testimony:

> Some very unique products—like managing to put analog circuitry and digital circuitry on the same chip—may not contain unique circuit designs of a patentable nature. Yet the layout (the mask work) for such a product is quite unique, involving much original and innovative effort. Patents cannot protect that effort.

Statement of Dr. Christopher W. Layton at 8–9 on file in the offices of the Subcommittee on Patents, Copyrights, and Trademarks.

Another practical consideration militates against reliance on patent protection: the time required to obtain a patent. In an industry such as semiconductor chip manufacturing, the fast pace of technological change limits the usefulness of a patent, which may take place to obtain. While the Patent and Trademark Office is making process in

[5] Professor Miller's prepared statement before the Subcommittee was inadvertently omitted from the printed hearing record. It is retained in Subcommittee files.

reducing these delays, much of the time required to obtain a patent is inherent in a system which relies upon examination of prior art, and which requires a determination of novelty and unobviousness in order to award protection.

C. TRADE SECRET PROTECTION

Trade secret law is not helpful in protecting chip design. The secrecy of a chip layout is dissipated once chips go on sale. As Dr. Layton testified, "the integrated circuit chip is one of the few products I am aware of where the blueprint [*i.e.*, the mask work] as imprinted on the product itself. *Hearing* at 79. As Professor Miller observed, "given the mass marketing of semiconductor products, the notion of trade secret protection seems to be entirely incompatible with the realities of the industry." Statement of Prof. Miller, *supra* note 5, at 8.

V. History of Legislation

A proposal to afford copyright protection for semiconductor chips was first introduced in the First Session of the 96th Congress (H.R. 1007) and was the subject of a hearing before the Subcommittee on Courts, Civil Liberties and the Administration of Justice of the House Committee on the Judiciary on April 16, 1979. *Copyright Protection for Imprinted Design Patterns on Semiconductor Chips: Hearings on H.R. 1007 Before* the Subcomm. on Courts, Civil Liberties and the Administration of Justice of the House Comm. on the Judiciary, 96th Cong., 1st Sess.) No further action was taken on the proposal during the 96th Congress. Two bills were introduced in the 97th Congress, which were similar to S. 1201 (H.R. 7202 and S. 3117), but no action was taken on either of them.

S. 1201 was introduced by Senators Charles McC. Mathias and Gary Hart on May 4, 1983. It was the subject of a hearing before the Subcommittee on Patents, Copyrights and Trademarks on May 19, 1983. Witnesses included Hon. Don Edwards, Representative from the State of California; Dorothy Schrader, Associate Register of Copyrights for Legal Affiairs and General Counsel of the Copyright Office; Thomas J. Dunlap, Christopher K. Layton, and Richard H. Stern, who appeared on behalf of the Semiconductor Industry Association; Arthur J. Miller, professor of law from the Harvard Law School; A. G. W. Biddle, on behalf of the Computer and Communications Industry Association; Ronald Palenski, Associate General Counsel of the Association of Data Processing Service Organizations; and Jon Baumgarten, for the Association of American Publishers.

On November 17, 1983, the Subcommittee on Patents, Copyrights and Trademarks gave unanimous approval to an amendment in the nature of a substitute to S. 1201 offered by Senator Mathias. The major changes made by the amendment were the following:

1. The copyright owner's exclusive right to control use of chips embodying the copyrighted mask work was eliminated.

2. A provision (Section 5 of the bill) was added expressly guaranteeing the right to use a chip or mask for purposes of reverse engineering.

3. The compulsory license provisions were replaced by a section (Section 7) providing immunity to innocent infringers, before they receive notice of infringement, and limiting remedies available to a copyright owner against certain innocent infringers even after notice is received. The amendment also expressly extended to good faith purchasers from innocent infringers the immunity provided to the infringers themselves.

4. A savings provision (Section 9) was added to strengthen the disclaimer of intent to affect existing rights in other copyrighted works.

5. The effective date provision was revised to allay concerns about retroactive application of the new copyright protection, and to confer "grandfather rights" on certain copyists.

The amendment in the nature of a substitute also made numerous technical changes to the original text of S. 1201. On April 5, 1984, the Committee on the Judiciary approved for reporting S. 1201, as amended by the Subcommittee on Patents, Copyrights and Trademarks, with an additional technical amendment offered by Senator Mathias.

As of May 2, 1984, the following Senators had been added as cosponsors of S. 1201: Senators DeConcini, Bingaman, Wilson, Hatch, Laxalt, Denton, Kennedy, Cranston, Tsongas, Leahy, Domenici, East, Percy, Dixon, Tower, Armstrong, Chiles, Byrd, and Thurmond.

VI. Summary of the Bill

The bill addresses two major issues. First, it protects the substantial investment of owners of the work in masks for semiconductor chips against misappropriation by unauthorized copiers. Second, it protects semiconductor chip users from liability for innocent conduct and also guarantees the right of competitors to "reverse-engineer" chips in order to create improved versions of chips.

A summary of the legislation, as reported by the Committee, follows (a more detailed sectional analysis appears in Section VIII of this Report):

SECTION 1. TITLE

Section 1 of the bill provides that the Act will be cited as the "Semiconductor Chip Protection Act of 1984."

SECTION 2. DEFINITIONS

Section 2 of the bill defines the terms "semiconductor chip product," "mask work," and "mask," and it amends Section 101 of the Copyright Act (17 U.S.C. § 101) to include them.

"Semiconductor chip products" are defined as multilayer products etched into semiconductor material in accordance with a predetermined pattern, which are intended for use as electronic circuits and which are writings or the manufacture, use, or distribution of which is in or affects commerce. "Mask works" are defined as series of related images embodying the pattern of the surface of the layers of semiconductor chips. A "mask" is an embodiment of one of the images in the mask work; it is used like a stencil to etch a layer of a semiconductor chip.

This Section provides that masks and mask works are not pictorial, graphic or sculptural works under the Copyright Act. Also, the copyright in a mask work is declared not to affect other copyrightable works, such as literary works or computer programs, that may be embodied in a semiconductor chip product.

Section 2 also provides that labeling requirements and provisions of certain other sections of the Copyright Act applicable to "copies" of copyrighted works shall apply to semiconductor chip products.

SECTION 3. SUBJECT MATTER OF COPYRIGHT

Section 3 of the bill amends 17 U.S.C. § 102(a) by adding "mask works" as one of the specifically enumerated categories of copyrightable works.

SECTION 4. EXCLUSIVE RIGHTS

Section 4 of the bill amends 17 U.S.C. § 106 by adding to the present categories of exclusive rights under copyright law a new right as to mask works. The exclusive right of the owner of the copyright in a mask work is to embody or to reproduce an image of the mask work into an individual mask, or chip, and to distribute masks or chips so made.

SECTION 5. REVERSE ENGINEERING

Section 5 of the bill limits the exclusive rights of the owner of a copyright on a mask by guaranteeing to others the right of reverse engineering.

SECTION 6. DURATION

Section 6 of the bill limits the duration of mask work copyrights to ten years.

SECTION 7. INNOCENT INFRINGEMENT

Section 7 of the bill provides that innocent purchasers of semiconductor chip products are not infringers and are not liable for damages or other remedies for their innocent conduct. Innocent conduct is good faith purchase or distribution of the product without having notice that it is protected by someone else's copyright. This Section also limits the remedies available to the owner of a copyright in a mask work against an innocent purchaser even after notice of infringement, if certain conditions are met.

SECTION 8. IMPOUNDING AND SEIZURE

Section 8 of the bill amends the impoundment and seizure provisions of Sections 503(a) and (b), and 509(a) of Title 17 by including masks in the same category as plates, molds, film negatives, and other articles used to make infringing copies.

SECTION 9. SAVINGS CLAUSES

Section 9 provides that the copyright in a mask work shall not add to or take away from other copyrights. It also applies the "first sale" doctrine to chips.

SECTION 10. EFFECITVE DATE

Section 10 of the bill makes the Act effective prospectively, and provides certain grandfather rights to competitors who copied previously distributed products.

VII. General Approach of S. 1201

COPYRIGHT OR SUI GENERIS PROTECTION

The Committee gave careful consideration to two general approaches to semiconductor chip protection. While all the witnesses who testified before the Subcommittee on Patents, Copyrights and Trademarks agreed that some legislation was needed to protect the creators of semiconductor chip layouts from chip piracy, opinions differed on how best to accomplish that purpose. Some witnesses favored the approach taken by S. 1201, which creates a new category of copyrightable works, and provides for copyright protection for mask works within the body of the existing Federal copyright law itself. Others suggested that a new form of "modified copyright-like protection" be created, and that such *sui generis* protection be provided separately from existing copyright legislation.

The Committee recognizes that the creation of the new category of "mask works" extends copyright protection to a kind of expression not currently covered by copyright. As Senator Mathias has noted, "(B)y bringing chip design under the protection of the copyright system, we are asking the system to do something that it has never been called upon to do before. The copyright law seems to be the best tool at hand to get the job done, but I think we have to make sure that it is not stretched out of shape in order to accommodate this new need." *Hearings* at 2.

The Committee concludes that the copyright system is not only adequate, but well suited to the task at hand. On balance, it concludes that protection can best be provided within the framework of existing copyright law, rather than through the creation of a new and untried form of *sui generis* protection. Several reasons support this conclusion.

First, the history of the expansion of copyright protection to new forms of expression indicates that, while the extension of protection to mask works requires taking a step beyond the present boundaries of copyright, it does not involve a giant leap. Although the most familiar types of subject matter of copyright protection, such as books or graphic works, may seem far removed from utilization expressions, such as mask works, copyright today protects a vast range of works, some of which have value almost exclusively as utilitarian objects. As Professor Arthur Miller noted in testimony before the Subcommittee:

> [C]opyright protection extends far beyond works that only convey ideas or have artistic or intellectual merit. That point becomes graphic when one considers the virtually endless list of purely commercial and highly functional items that are now accepted by the Copyright Office and the federal courts as copyrightable, including belt bucklets, telephone books,

> ashtrays, eyeshades, door knockers, pill boxes, and advertisements. Today, it simply must be accepted that American copyright law extends protection to works of a highly—indeed, in some cases—entirely commercial character.

Statement of Prof. Miller, *supra* note 5, at *2*. (citation omitted).

This conclusion is fully supported by the leading court decisions on the Copyright Act. For example, in *Mazer* v. *Stein*, 347 U.S. 201 (1954), the Supreme Court noted that the industrial use of an article is no bar to its protection under copyright law, while in *Goldstein* v. *California*, 412 U.S. 546 (1973), the Court gave a broad reading to the constitutional reference to "writings . . . of an author," noting that there is no constitutional impediment to copyright protection for "any physical rendering of the fruits of creative intellectual or aesthetic labor." 412 U.S. at 561.

Second, the similarities between mask works and the kinds of expression already protected by copyright should not be underestimated. Masks are akin, both in function and appearance, to maps and technical drawings, which have long been accepted as subjects of copyright. Mask works are also like film images in many ways; the latter are covered under the Title 17 as "audiovisual works." The patterns etched or deposited on semiconductor material, and the masks used as stencils for the manufacture of these chips, are not visually dissimilar to pictorial and graphic works that are clearly copyrightable. In light of all these similarities, it is not surprising that the existing framework of copyright protection would suffice, with "a minimum amount of distortion", to provide protection against chip piracy. *Hearings* at 90 (remarks of Professor Miller).

Third, inclusion of chip protection within Federal copyright law would encourage certainty and stability within the field of semiconductor chip design. Applicable precedents under Federal copyright law would provide explicit guidance to the innovator, the practitioner of reverse engineering, and the would-be copist. The alternative approach of a new statute, containing many new concepts and terms, would promote uncertainty and invite costly litigation to define the parameters of the new form of protection.

Fourth, the international application of a *sui generis* statute raises further uncertainties. The Committee recognizes that the treatment that other nations will accord to U.S. copyright protection for semiconductor chip design is not entirely predictable, because of the differences between mask works and the traditional subject matter of copyright. However, the Committee intends that mask work copyrights should be treated like any other copyright for these purposes, and believes that foreign nations which are party to treaties with the United States requiring mutual recognition of copyrights will accord full comity to U.S. mask work copyrights. The Committee believes that the international recognition of a new species of protection, governed by a new statute, would be even more uncertain. Thus, although the size of the U.S. market justifies a strong chip protection statute, even if the protection is not recognized in other countries, the Committee believes that this factor of international recognition also argues in favor of copyright as opposed to *sui generis* protection.

Fifth, the copyright approach recommends itself by its simplicity and economy. While it is true that it is not appropriate to incorporate every principle of copyright protection in the context of semiconductor chip products, the necessary adjustments are far more limited than the effort that would be required to create a new form of "copyright-like" protection. Any *Sui generis* statute would inevitably borrow heavily from copyright principles and concepts. It makes more sense to include mask works within the existing framework of copyright law, with adjustments as appropriate, rather than to "reinvent the wheel" by reiterating standard copyright concepts in a new chapter of Title 17, or elsewhere in the U.S. Code.

Sixth, the Committee recognizes that the concern over expansion of copyright protection to include mask works is motivated in part by fears that the limited copyright for mask works will set a precedent for limitations on protection accorded other works now protected by copyright. As one witness representing the Association of American Publishers put it, "our concern . . . is one of certainty, precision, predictability, *and of not eroding the rights in our existing works.*" *Hearings* at 103 (testimony of Jon Baumgarten) (emphasis added). The amendments made to S. 1201 in Subcommittee embody the suggestions made by representatives of existing copyright proprietors, and make amply clear the intention to make no changes whatever in the rights currently enjoyed under the Federal copyright law by works other than mask works. A copyright approach will in no way affect the "certainty, precision, (and) predictability" of existing copyright protection; at the same time, it will make available to innovators in the narrow field of semiconductor chip design the same sort of "certainty, precision (and) predictability," which all witnesses agree is now sorely lacking. The Committee does not believe that the extension of copyright protection to mask works creates any realistic threat to the integrity or efficacy of existing copyrights, or of future copyrights in the kinds of works for which copyright protection is already available.

Accordingly, for these and other reasons, the Committee has concluded that it is preferable to amend the existing copyright law to cover mask works, rather than to create a new form of intellectual property protection for semiconductor chip designs. At the same time, the Committee recognizes that the question of how best to provide the needed protection against chip piracy is one as to which reasonable minds may and do differ.

SCOPE

It is the intent of the Committee in fashioning this legislation that the Congress exercise its full powers in this field. In this regard, primary reliance is placed on the Congress' enumerated powers under Article I, Section 8, Clause 8 of the Constitution, which authorizes the Congress to regulate "writings." In order to insure full scope for the remedial provisions of the bill, however, reliance is also placed on the Congress' broad power to regulate commerce under the Commerce Clause in Article I, Section 8, Clause 3. This approach obviates any possible problems or speculations regarding legislative power, such as those found in *The Trademark Cases*, 100 U.S. 82 (1878) (Trademark

Act held unconstitutional because it was based on Art. I, § 8, cl. 8, instead of on commerce power). Accordingly, even if a chip is not a "writing," this bill would prohibit piracy of chips by means of the commerce power. As a practical matter, virtually any conduct relating to chip piracy will be in or will affect commerce. As a practical matter, no risk inheres in the possibility that chips may not be regarded as writings. As Professor Arthur Miller of the Harvard Law School testified: "The use of two constitutional clauses to protect a copyrighted work is nothing more than using a belt and suspenders to protect that work." *Hearings* at 91.

VIII. Detailed Section-by-Section Analysis

SECTION 2. DEFINITIONS

(*1*) *Semiconductor chip product.*

The bill defines semiconductor chip products in terms of (1) their physical characteristics and (2) their intended use. A further limitation on the coverage of the legislation is also included: the protections of the Act apply only to those chips that are "writings" (as the Constitution uses that term) or else are in or affect commerce.

(*2*) *Mask works.*

The bill's definition of "mask works" in Section 2 is generally parallel to the present definitions of audiovisual works and motion pictures in Federal copyright law, 17 U.S.C. § 101 defines audiovisual works as a series of related images. In the case of a mask work, these related images are the images having the pattern of the various transitional or final layers of the semiconductor chip. The mask work or its images may be fixed in a set of "masks" (described in the following paragraph) or may be fixed or encoded in other tangible form such as a digitized representation of the mask work in magnetic tape. The digitized representation would be a listing of the numerical coordinates of the various boundary points for the parts of the images comprising the work, stored on the tape in computer code.

(*3*) *Masks*

The bill defines a "mask" in Section 2 as a sheet embodying one of the individual layer images making up the mask work. Typically, such sheets, as used in chip manufacture, are glass plates with transparent and opaque portions on them; the transparent portions admit, and the opaque portions screen out, ultraviolet radiation, as part of the manufacturing process. Such masks are used similarly to stencils for putting a pattern on the chips. For example, one mask of the mask work would be that used to make openings in a silicon dioxide coating on the chip in order to admit "dopants" such as boron to the silicon under the coating, thereby modifying the electrical properties of the silicon parts of the chip so "doped." Another mask would be that used to configure an upper layer of aluminum in the chip for making electrical contacts between parts of the chip. Thus, a single mask is related to a whole mask work much as a single frame (or image) of a motion picture is related to the whole work, or as a page or chapter of a book is related to the whole literary work.

It should be noted that although the use of masks to manufacture chips is the most prevalent technology today, it is not the only one. The bill is thus not limited to the manufacture of chips by means of masks. Rather, it covers any means of fixing the images of a mask work into semiconductor material. (*See* § 106(6)(D), added by Section 4 of S. 1201.) Thus, directly impressing the images into silicon, germanium, gallium arsenide, or any other semiconductor material by an electron beam in conjunction with a data base tape in which a mask work was stored would be within the coverage of S. 1201, even though no actual mask was used. *See Hearings* at 73–74.

Substantial similarity

A mask embodies a mask work, according to Section 2, when "the pattern of transparent and opaque portions of the mask is substantially similar to the pattern of one of the images of the mask work." By the same token, a semiconductor chip constitutes an infringement of the copyright in a mask work when the pattern etched into the chip is "substantially similar" to the pattern of one or more images of the copyrighted mask work.[6] The concept of "substantial similarity" referred to in this Section is a familiar one in existing copyright law, but its application in the semiconductor chip context merits brief discussion.

First, the bill incorporates the customary copyright principle that when similarity of expression results from the fact that a concept is capable of expression in only one or a few ways, duplication of the expression is not infringement, either because it results in a similarity not deemd "substantial similarity," or because such functionally dictated expressions are not copyrightable. *See Atari, Inc.* v. *North American Philips Consumer Electronics Corp.*, 672 F. 2d 607, 616–17 (7th Cir. *cert. denied*, 103 S. Ct. 170 (1982) (". . . similarity of expression . . . which necessarily results from the fact that the common idea is only capable of expression in more or less stereotyped form will preclude a finding of actionable similarity. . . .") ; *Durham Industries, Inc.* v. *Tomy Corp.*, 630 F. 2d 905, 912–13 (2d Cir. 1980) (. . . where the protected work and the accused work express the same idea, the similarity that inevitably stems solely from the commonality of the subject matter is not proof of unlawful copying. . . .") ; *Hoehling* v. *Universal City Studios, Inc.*, 618 F. 2d 972, 979 (2d Cir. 1980) ("Scenes a faire" are uncopyrightable because it is virtually impossible to write about some themes without using them.) ; *Morrissey* v. *Procter & Gamble Co.*, 379 F. 2d 675, 678–79 (1st Cir. 1967). Accordingly, if the pattern of a part of a mask were dictated by function, so that only one or a few ways existed in which to make the chip in question, then another chip would not be infringing merely because it used that pattern.

Some witnesses expressed the concern that chip copyrights might be exploited to create patent-type monopolies over functional features of semiconductor chips, without the requirements of the patent law

[6] It should be noted that the pattern etched into the final version of the chip may differ materially from the pattern of individual masks, because masks used later in the manufacturing process may undo what earlier-used masks effected. Thus, a particular mask may be substantially similar to only an intermediate form of the semiconductor chip product.

having first been satisfied.[7] *See Hearings* at 89 (testimony of Professor Miller), 100 (testimony of A. G. W. Biddle), 117–118 (statement of Patent Task Force, USAB, IEEE). The substantial similarity requirement should allay that concern. If a defendant in a chip copyright infringement case convinces the fact-finder that the copied chip or part of a chip was capable of expression in only one or a few ways, then the defendant would prevail on the charge of copyright infringement of the functionally dictated copied part. This result would be reached regardless of whether the "copyrightability" or the "substantial similarity" analysis is employed.

Second, the bill follows the customary copyright principle that when the amount of a work copied is minimal, the copying will not create "substantial similarity" between the two works. *Caddy-Imler Creations, Inc.* v. *Caddy*, 299 F.2d 79 (9th Cir. 1962). Thus, if only a small portion of two chips is similar, there will not be any copyright infringement. On the other hand, copying only one chapter from a book or one essay from a volume is not excused by the plagiarist's failure to copy all the other chapters or essays.[8] Unfortunately, there is no hard and fast percentage "rule of thumb" for determining substantial similarity. The Committee believes, however, that the question is more theoretical than real, because of the business realities of the chip industry. The economics of chip copying appear to favor either wholesale copying or else none at all; it is not economical for a pirate to copy only a small part of a chip and then incur the expense of engineering other parts.

Third, even though no percentage "rule of thumb" can be stated, some qualitative observation is in order. It is generally recognized in copyright law that the degree of similarity two works must share in order for one to be considered "substantially similar" to, and therefore an infringement of, the other, may depend on the subject matter. For a play or highly creative drawing, courts may sweep up a broad range of paraphrases as being within the expression of the copyrighted work. But for a plastic toy or commercial document, almost identical copying may be required before any infringement is found. *Universal Athletic Sales Co.* v. *Salkeld*, 511 F.2d 904 (3d Cir. 1975); *see Continental Casualty Co.* v. *Beardsley*, 253 F.2d 702 (2d Cir. 1958) ("stiff standard for proof of infringement"); *Dorsey* v. *Old Surety Life Ins. Co.*, 98 F.2d 872 (10th Cir. 1938 (to constitute infringement of contract form appropriation must be "in exact form or substantially so"); *Thomas Wilson & Co.* v. *Irving J. Dorfman Co.*, 268 F. Supp. 711 (S.D.N.Y. 1967) (only limited protection of lace design from similar designs is warranted because quantum of originality is modest; denial of preliminary injunction); *cf. Durham Industries, Inc.* v. *Tomy Corp.*, 630 F.2d 905, 908–10 (2d Cir. 1980) (plastic toys too trivially different from Disney characters to support new copyright); *L. Batlin*

[7] This may be only a theoretical concern. Some witnesses testified that rarely or never will the function of a semiconductor chip dictate its form and thus dictate the expression contained in a mask. Instead, there are usually a vast number of different ways to express the layout of a semiconductor chip in order to achieve a desired function. *Hearings* at 145.

[8] For this reason, copying individual copyrighted "cells" forming part of a "cell library" of building blocks for chips may be an infringement. This would be so only if the cells' layouts were not functionally dictated, and if the copying were otherwise close enough to meet the substantial similarity test.

& Son, Inc. v. *Snyder*, 536 F.2d 486 (2d Cir. 1976) (toy bank too trivially different from original to support copyright). The case of semiconductor chips falls between these two extremes.

Some concern was expressed in the hearings over the kind of evidence that should be considered in determining whether a second comer's chip is so close to an earlier copyrighted chip that the two are "substantially similar." Some courts have declined to permit expert testimony in copyright litigation on the issue of substantial similarity, believing the question to be determinable only by an overall subjective evaluation based on the spontaneous impression of a lay observer. *See, e.g., Sid & Marty Krofft Television Prod., Inc.* v. *McDonald's Corp.*, 562 F.2d 1157 (9th Cir. 1977) ("analytic dissection and expert testimony" held inappropriate); *Harold Lloyd Corp.* v. *Witwer*, 65 F.2d 1, 18 (9th Cir. 1933); *Davis* v. *United Artists*, 547 F. Supp. 722 (S.D.N.Y. 1982). *Compare Nichols* v. *Universal Pictures Corp.*, 45 F.2d 119, 123 (2d Cir. 1930) (expert testimony should be excluded), *cert. denied*, 282 U.S. 902 (1931), *with Arnstein* v. *Porter*, 154 F.2d 464, 468, 473 (2d Cir. 1946) (expert testimony should be allowed on whether similarities are sufficient to prove copying, but should not be allowed on whether copying is illicit or works "seem . . . to be inexcusably alike"). The Committee takes no position on the correctness of these decisions in other copyright contexts. The Committee intends, however, that expert testimony on the question of "substantial similarity" should be admitted in cases arising under the Semiconductor Chip Protection Act of 1984. The better view, the Committee believes, is that expressed in the hearing record by one expert on chip technology:

> Second, it has been said that even very subtle mask changes may represent significantly different and original designs. This is true. It has been further said that exactly the sort of tests that demonstrate such differences are specifically disallowed as defenses in copyright infringement cases. I do not believe this is true, for I have been informed otherwise. But I feel that evidence of this type should be allowed in semiconductor chip copyright infringement cases and hope that the legislative history of S. 1201 would include a statement endorsing use of expert testimony to show subtle functional differences in circuit layouts.

Hearings at 145–146 (letter from Leslie L. Vadasz, Intel Corp.). Accordingly, it would ordinarily be appropriate to permit expert testimony on all aspects of the "substantial similarity" or copyright infringement issue in cases arising under this bill, just as it would on the issue of reverse engineering (*see* discussion of Section 5 (Reverse Engineering) *infra*).

Copies

Section 2 of S. 1201 provides that the provisions of section 109(a), 401, 405, 406, 501(a), 503, 506, 509, and 602 of Title 17, which impose certain requirements, prohibitions, and remedies applicable to "copies" of literary, musical, pictorial, and other copyrighted works, shall apply also to semiconductor chip products. Generally, S. 1201 avoids the use of the term "copy" to apply to semiconductor chip products. This is to make it clear that the Semiconductor Chip Protection Act is

not intended to disturb the settled principle of American copyright law that a copyrighted pictorial work that depicts a physical object is not infringed by the object itself. The object is not a "copy" of the depiction, for copyright purposes. For example, a copyright on a picture of a dress or a bridge or on blueprints for a house does *not* prohibit others from making the dress or building the bridge or house. *See Imperial Homes Corp.* v. *Lamont*, 458 F.2d 895, 899 (5th Cir. 1972) (house); *Russell* v. *Trimfit, Inc.*, 428 F. Supp. 91 (E.D. Pa. 1977) (socks), *aff'd*, 568 F.2d 770 (3d Cir. 1978); *DeSilva Construction Corp.* v. *Herrald*, 213 F. Supp. 184, 195–96 (M.D. Fla. 1962) ("the building is not a copy of the plans"); *Muller* v. *Triborough Bridge Authority*, 43 F. Supp. 298 (S.D.N.Y. 1942) (bridge approach); *Jack Adelman Inc.* v. *Sonners & Gordon, Inc.*, 112 F. Supp. 187 (S.D.N.Y. 1934) (dress). *See also* 17 U.S.C. § 101 (definitions of pictorial work, useful article). Because of this body of law, which S. 1201 does not disturb, a semiconductor chip product is not a "copy" of the mask work it embodies. Nor is it necessary to define a chip as a "copy" of anything in order to accord the chip protection against piracy. S. 1201 simply prohibits piratical acts directly by enumerating them in Section 106(6)(A)–(E).

Nonetheless, some of the requirements of Federal Copyright law as to "copies" should, for common sense reasons, apply to chips. Those provisions are enumerated above. For example, Section 109(a) of Title 17 provides that the first authorized sale of a copy of a work wholly exhausts the copyright owner's right to control the use or resale of the particular copy. The same principle should apply to the sale of a chip, so that once the copyright owner or its licensee sells the chip, all subsequent purchasers are free to use or resell the same chip on any basis they wish.

Section 401 of Title 17 requires placement of a copyright notice on each publicly distributed copy of a work. This requirement should be applicable to chips that embody copyrighted mask works. Sections 405 and 406 likewise involve copyright notice.

Section 501(a) of Title 17 provides that importing a copy of a copyrighted work is an act of copyright infringement. Importation of chips that embody copyrighted mask works should be similarly treated as infringement.

Section 506 of Title 17 provides for the forfeiture and disposition of infringing copies of a work and prohibits removal of copyright notice from copies of copyrighted works. Section 509 provides for seizure of infringing copies of copyrighted works and also of equipment used to make such copies. Section 602 provides that importation of unauthorized copies of a work is a copyright infringement. These same rules should apply to chips that embody copyrighted mask works.

Other provisions of Federal Copyright law that apply to "copies" of works are omitted from incorporation in this legislation because they appear to be inapplicable or inappropriate in the case of chips. For example Section 407 of Title 17 requires deposit in the Library of Congress of two complete copies of the best edition of the work; deposit of chips in the Library of Congress would serve no useful purpose.[9]

[9] The Copyright Office has been successful in litigation against a semiconductor chip manufacturer who sought to compel the Copyright Office to accept a chip for deposit. *Intel Corp.* v. *Ringer*, unreported (C77–2848 N.D. Cal. 1978, voluntary dismissal of complaint).

Another section inappropriate for application to chips is Section 710, which concerns distribution of copies of works for the use of blind and handicapped persons.

SECTION 3. SUBJECT MATTER

The bill amends the present copyright laws and adapts their remedies to protect semiconductor chips. Section 3 adds a new category of "work" to those works already protected under the Federal copyright laws. 17 U.S.C. § 102(a) currently protects literary works, musical works, dramatic works, choreographic works, pictorial works, motion pictures and other audiovisual works, and sound recordings. The bill lists "mask works" as an additional category of protected work.

SECTION 4. EXCLUSIVE RIGHTS

Section 4 defines the exclusive rights accorded the owner of a copyrighted mask work. It does so by adding a further paragraph to 17 U.S.C. § 106. Existing subsections of § 106 set forth the exclusive rights enjoyed by the owners of the different types of copyrightable works that are currently recognized in the Federal copyright law. The rights under new Section 106(6) are not in addition to those given by the preceding subsections of § 106, but are in lieu of them and apply only to copyrights in mask works. The Committee believes it better to specify the particular rights of owners of these copyrights in terms specific to chips, rather than to try to squeeze such rights into the existing rights and terminology appropriate for books, sheet music, and the like. The exclusive rights accorded the owner of a mask work are:

To make masks embodying the copyrighted work;
To distribute such masks;
To embody images of mask works in chips;
To reproduce images of a mask work onto a layer of a chip; and
To distribute such chips.

The fourth of these exclusive rights is intended to be inclusive of all means of embodying the images of a mask work onto a chip. This includes not only the use of masks to do so, but also new technological processes of impressing the images of a mask directly onto the chip with the aid of a computer-driven light beam or electron beam, where the images of the mask work are previously fixed or stored in "digitized" form in a computer tape and wherein manufacturing there is no use of an actual mask. The Committee intends this provision to have sufficient breadth to cover foreseeable advances in chip manufacturing technology, so that pirates will not be encouraged to try to exploit loopholes in the law.

"Use" right

As introduced, S. 1201 also provided an exclusive right to the *use* of chips made in accordance with the mask work. Thus, a commercial user of a computer containing a pirated chip would have been required to compensate the copyright owner. In the hearings, some witnesses objected to the creation of an exclusive right to use semiconductor chips that embody the copyrighted mask work. *Hearings* at 20,

46, 48–49, 90–91, 92–93, 108. (Copyright in works other than chips does not, under current copyright law, include the power to recover for *use* of infringing copies. *See Hearings* at 92 (remarks of Senator Mathias). Thus, buying or reading an unauthorized copy of a book is not an act of infringement.) While the use right would enable copyright owners to sue users of infringing chips who are not innocent, and could thus provide a remedy in some situations in which other infringers (such as the manufacturer of the pirated chips) could not be reached, the Committee concluded that this limited degree of added protection for the copyright owner does not warrant the creation of a new type of right under the copyright law. Accordingly, the use right has been eliminated from the list of exclusive rights relating to mask works, and other references to it in the bill have been deleted.

SECTION 5. REVERSE ENGINEERING

Limitations on these exclusive rights are imposed by Sections 5 and 7 of the bill. Section 5 provides an exemption for "reverse engineering." This is an accepted practice in the semiconductor chip industry whereby a competitor studies and analyzes an existing chip in order to try to make an improved or related version.

Reverse engineering serves a valuable function in the chip industry. Often, the goal of reverse engineering is to design a chip with the same electrical and physical performance characteristics as an existing chip (so-called "form, fit and function" compatibility). This enables the second chip to compete directly against the original chip, or to become a second source for it, thus assuring stability of supply. Reverse engineering also spurs innovation and technological progress, as competitors seek to develop ever faster or more efficient chips, to perform similar or related functions.

Such legitimate reverse engineering is not prohibited by the bill. Rather, the bill is directed at the appropriation of substantial parts of the drawings embodied in the masks and chips, when that is done to take free advantage of the first comer's great costs in developing the layout of the chip. Accordingly, the bill provides that it is not an infringement of copyright to reproduce the images of the mask work solely for the purpose of teaching, analysis, or evaluation, or to use the concepts or techniques embodied in the mask or chip, such as the circuit schematic or organization of components.

The legal rights of a chip innovator faced today with an apparent piracy are, to, say the least, very uncertain and confused. Enactment of this bill will go a long way toward clarifying those rights, although in theory there may be cases in which the line between legitimate reverse engineering and the misappropriation forbidden by this bill would be unclear. But, as previously noted in regard to "substantial similarity," as a practical matter, it does not make economic sense for a pirate to appropriate the fruits of a chip innovator's mask design labor unless the appropriation is wholesale.

There are two reasons for this. First, it will ordinarily not be economical for the pirate to copy only part of an original chip and contribute his own engineering designs for the rest. As a practical matter, the costs involved deprive the pirate of much of the benefit he seeks

through his piracy. Second, the various parts of a chip are usually so integrated and interrelated that copying only part will not result in a usable end product—at least, again, not without significant economic investment in R&D on the part of the pirate, an investment unlikely to be made. Hence, cases will rarely arise that are in a gray zone between clear copying and clearly legitimate reverse engineering, since most actual fact situations in this field are either at one end or the other of the spectrum.

Additionally, this gray zone will be further reduced by use of the kind of evidence that courts should rely on to distinguish legitimate reverse engineering from piratical copying. As one expert pointed out, reverse engineering leaves a "paper trail" not found in the files of pirates:

> Whenever there is a true case of reverse engineering, the second firm will have prepared a great deal of paper—logic and circuit diagrams, trial layouts, computer simulations of the chip, and the like; it will also have invested thousands of hours of work. All of these can be documented by reference to the firm's ordinary business records. A pirate has no such papers, for the pirate does none of this work. Therefore, whether there has been a true reverse engineering job or just a job of copying can be shown by looking at the defendant's records. The paper trail of a chip tells a discerning observer whether the chip is a copy or embodies the effort of reverse engineering. I would hope that a court deciding a lawsuit for copyright infringement under this Act would consider evidence of this type as it is extremely probative of whether the defendant's intent is to copy or to reverse engineer.

Hearings at 146.

The Committee agrees with and adopts that view as a guide to its intent.

Several witnesses at the hearing expressed concern that the courts might not interpret the Act to provide for reverse engineering (*Hearings* at 100–101, 102, 103, 114–115) while one witness objected on conceptual grounds to the inclusion of reverse engineering under the rubric of "fair use (*Hearings* at 103–105)." To respond to these concerns, the version reported by the Subcommittee and the Committee includes an express provision guaranteeing the right to use a chip or mask for reverse engineering purposes. This right is not termed a form of "fair use," but is simply described in S. 1201 without reference to "fair use."

SECTION 6. DURATION

Section 6 of the bill provides a ten-year copyright for semiconductor chip products. The Committee does not believe that the 75-year term of copyright in ordinary works is needed in the case of semiconductor chip products. A ten-year term appears sufficient to provide incentives and security of investment to encourage a desired level of innovation and R&D. This term is also consistent with that generally afforded industrial property.

Copyright in a mask work—or in any other work—would subsist from the moment of its fixation on paper, in tape, or otherwise. *See*

17 U.S.C. 102(a). The duration of protection continues only for ten years after whichever of the following acts occurs first: (1) distribution of semiconductor chip products embodying the mask work; (2) use of the semiconductor chip product in a commercial product, regardless of whether the product is distributed (for example, use of a semiconductor chip product internally in the facilities of its manufacturer, as in a computer-aided manufacturing process); or (3) manufacture of semiconductor chip products in commercial quantities, even if they are not distributed at once. The phrase "of semiconductor chip products made as described in subparagraphs (C) and (D) of paragraph 6 of section 106," which appears at the end of section 6, is intended to apply to each of clauses (1), (2), and (3) of subsection (f); the Committee intends to clarify this point on the Senate floor.

SECTION 7. INNOCENT INFRINGEMENT

Section 7 provides an immunity from liability for innocent infringers, i.e., those who purchase infringing chips in good faith, without notice that the chip is the product of piracy of a copyrighted mask work. It addresses the situation in which a party innocently treats a chip that embodies a copyrighted mask work in a manner that would otherwise constitute an infringement of the exclusive rights of the copyright owner. Most typically, this situation will occur when a party distributes a product that contains a chip that, unbekownst to him, is an unauthorized copy of a chip embodying a copyrighted mask work. (References to "use" throughout this section refer only to uses that infringe exclusive rights. Ordinarily, the innocent purchaser's infringing use will be unauthorized distribution. *See* proposed 17 U.S.C. 106(6)(E).)

First, according to new Section 511(a) of Title 17, as added by Section 7, an innocent purchaser of an infringing chip is not liable at all for any conduct with respect to the distribution of chips that occurred before the innocent purchaser had notice of copyright infringement. Thus, in the typical situation, there is no liability for distribution of infringing chips before notice is received.

Second, under new Section 511(b), even after an innocent purchaser acquires notice of copyright infringement, the innocent purchaser's subsequent conduct may also deserve a privileged status. If the innocent purchaser had already committed substantial funds to the development of a product built around the infringing chip before learning of the copyright, to compel the innocent purchaser to abandon manufacture of the product could work an undue hardship. For example, a personal computer may be innocently designed around an infringing microprocessor chip, which is incorporated into and distributed as a part of the personal computer. The innocent infringer who can demonstrate "equities" on his side becomes entitled under Section 7 of the Act (new 17 U.S.C. § 511(b)) to continue to utilize the chip subject to payment of a reasonable royalty to the proprietor of the copyrighted mask work embodied in the chip.

In general, the concept of the balance of equities under new Section 511 of Title 17 would be like that provided in Section 252 of the patent

laws (35 U.S.C. § 252), which protects intervening rights of manufacturers of products that are subject to a reissue patent. In addition, under new Section 511(c), persons farther down the distribution chain have equivalent rights if they too are good faith purchasers. Moreover, the seller's payment of a reasonable royalty makes the product, in the hands of a purchaser from that seller, a licensed product.

The reasonable royalty provision applies only to chips distributed *after* the innocent purchaser acquires reasonable notice of copyright infringement. No royalty is required from the innnocent purchaser as to products already sold before the innocent purchaser had notice, nor is any royalty required for other past conduct that is wholly completed before notice.

The purpose of these provisions is to strike a fair balance among competing interests and equities. On the one hand, the intellectual property rights of chip creators should be respected, both as a matter of fairness and in order to provide necessary investment incentives and facilitate capital formation supporting chip innovation. On the other hand, good-faith innocent parties who invest in chip-using products should not have their investments threatened by chip copyrights which could not reasonably have been anticipated, so long as they pay fair compensation to the owner of the chip copyright. The provisions of this Section strike what the Committee believes is a fair balance between these competing interests. The result is that an innocent purchaser-distributor of a new chip, and that party's customers, get an immunity from liability for completely innocent infringement and a limitation of liability for conduct that occurs after they learn of the chip copyright, but are already financially committed to using the chip.

New Section 511 (b) lists five facts that the innocent purchaser must establish in order to be entitled to a limitation on liability for acts of infringement occurring after receipt of notice. Four of these pertain to all such acts of infringement, and provide the standard for limiting liability in the typical case of distribution of a pirated chip. In such a case, the innocent purchaser must show a substantial commitment of funds to the infringing use of the chip (Section 511 (b)(1)); a threat of substantial out-of-pocket losses (beyond the added expense of purchasing authorized rather than pirated chips (Section 511(b)(2)); and an intention to limit the infringing use to the use made before the purchaser had notice of infringement (Section 511(b)(3)). Additionally, the innocent purchaser must show that it would be "inequitable in the circumstances" to refuse to limit his liability (Section 511(b)(5)). The Committee recognizes that these tests overlap to some extent, but it concludes that, taken as a whole, they adequately describe the factual circumstances which must be shown to exist in order to justify permitting the purchaser to continue to infringe the exclusive rights of the copyright proprietor by distributing products containing a pirated chip.

A further limitation of liability is available when the innocent purchaser demonstrates that the owner of the copyright in the maskwork embodied in the chip (and its licensees, if any) do not or will not make the chip available for sale to the locked-in, innocent purchaser-distributor at a reasonable price. New Sections 511 (d)(4) provides that

if the copyright owner and the copyright owner's licensees, if any, cannot supply the chip at a reasonable price to an innocent purchaser who later has notice of copyright infringement, and if the other equitable circumstances enumerated in new Section 511(d) are established, that purchaser may make the chip or purchase the chip from a non-licensed source, subject to payment of a reasonable royalty rate to the copyright owner.

Reasonable royalty

The question of what constitutes a "reasonable" royalty for the chip is a matter, in part, of the equities of the user; and, in part, a more objective question—usually posed as what a "willing purchaser" would pay a "willing seller" if they negotiated a license in good faith. This customary test or standard for "reasonable royalty" is described more fully in decisions construing 35 U.S.C. 284, such as *Horvath* v. *McCord Radiator & Mfg. Co.*, 100 F.2d 326 (6th Cir. 1938) (". . . that which would be accepted by a prudent licensee who wished to obtain a license but was not so compelled and a prudent patentee who wished to grant a license but was not so compelled . . .[;] that amount which a person desiring to use a patented machine and sell its product at a reasonable profit would be willing to pay."). . . . That section of the patent law provides that a patentee shall recover as damages "in no event less than a reasonable royalty for the use made of the invention." *See also* 28 U.S.C. § 1498 (requiring the government to pay "reasonable and entire compensation" for the infringement of a patent or copyright, which compensation is generally equated to a "reasonable royalty"). *Decca Ltd.* v. *United States*, 640 F.2d 1156 (Ct. Cl. 1980); *Leesona Corp.* v. *United States*, 599 F.2d 958 (Ct. Cl. date) *cert. denied*, 444 U.S. 991 (1979). The term "reasonable" as applied to price has the same meaning as it does with regard to royalty rate in the foregoing case law precedents.

Requisites of notice

Under proposed 17 U.S.C. 511(d)(2), notice of infringement means actual notice or reasonable grounds for belief. An example of the former would be a letter from the copyright owner to the infringer advising the latter that a specific chip is copyrighted. An example of the latter might be the occurrence of wide-spread publicity in the trade press.

Compulsory license

As originally introduced, S. 1201 required the copyright holder to grant a compulsory license, under certain conditions, to persons who innocently purchased infringing chips and only later received notice of infringement. Some concern was expressed about the precedential effect of creation of another compulsory license under Title 17, *see* 17 U.S.C. §§ 111(d), 113, 115, 116, 118, although there was general agreement that, in some circumstances, innocent infringers should not be subject to the full range of copyright remedies, even after they have learned of the infringement. Accordingly, the compulsory license provisions of S. 1201 were deleted and are now replaced by the provisions described above, to be located within Chapter 5 of Title 17 ("Copyright Infringement and Remedies"). Additionally, a provision ex-

pressly immunizing good faith purchasers from an innocent infringer has been included (new Section 511(c)), and the entire Section has been reorganized by placing all definitions in one subsection at the end of the Section (Section 511(d)).

SECTION 8. IMPOUNDMENT AND SEIZURE

Section 8 of the bill places masks on the same footing as film negatives and other means for making products that are subject to copyright protection. The existing copyright law provides for the seizure and impounding of such means of production, and Section 8 simply extends the same provisions to chip manufacture.

SECTION 9. SAVINGS PROVISIONS

Several witnesses expressed concern that S. 1201 might in some way decrease the existing rights of owners of copyrights in computer programs, data bases, or other works now or hereafter embodied in chips, and that the bill's attempt to disclaim such a result was ambiguous. *See Hearings* 41–42, 47–48, 104, 105–106, 109. Accordingly, the disclaimer which follows the definition of "mask" in Section 2 has been expanded and a further new savings provision has been added as Section 9. The Committee thus intends this bill neither to add to, nor detract from, any copyrights in literary works or other works placed into chips.

The same clause makes it clear that the existing "exhaustion" doctrine applies to chips with the same force as it does for other works. See *Bobbs-Merrill Co.* v. *Straus*, 210 U.S. 339 (1908); *Adams* v. *Burke*, 84 U.S. (17 Wall.) 453 (1873); *American Int'l Pictures* v. *Foreman*, 576 F. 2d 661, 664 (5th Cir. 1978); *Independent News Co.* v. *Williams*, 293 F 2.d 510 (3d Cir. 1961). The Copyright Office expressed concern that this legislation might impair the "first sale" doctrine of 17 U.S.C. § 109 and the above-cited case law. *Hearings* at 22–23, 46, 48–49. However, the language of Section 9 should make it clear that the intention of Congress is to continue and carry forward in this legislation the entire existing body of law concerning the exhaustion of copyright by the first authorized sale of the copyrighted product.[10]

Similarly, enactment of the Semiconductor Chip Protection Act will have no effect on the copyright status of works such as software embodied in chips. Specifically, the limitations on copyright in mask works—for example, the limitation on liability for innocent infringers—create no precedent for imposing similar limitations on other expressions already fully protected by the copyright law.

SECTION 10. EFFECTIVE DATE

The effective date provision of the bill explicitly disclaims the creation of any copyright liability for conduct occurring prior to enactment. It also confers "grandfather rights" upon copyists who commercially distributed their copied chips in the U.S. prior to January 1, 1980. Thus, if an alleged pirate began selling his copied version of chip X on December 28, 1979, he can continued to sell his version of the

[10] In addition, the last paragraph of Section 2 of the bill expressly applies 17 U.S.C. § 109(a) to semiconductor chip products.

copied chip X (or any improvement thereof that he creates) forever. If a pirate began selling copied chip X on January 2, 1980, however, he must stop selling it after the bill is enacted (but he has no liability for his preenactment conduct).

Although the bill expressly disclaims creating liability for conduct occurring prior to its enactment, Section 10 arguably has retroactive implications by prohibitnig the distribution *after* the Act's enactment of some chips manufactured *before* the Act's enactment of some chips manufactured *before* the Act's enactment. Section 10's retroactivity is by no means clear: The Supreme Court has hesitated to describe as "retroactive" a Federal statute which, in essence, decreased a farmer's wheat marketing quota after he had planted his crop, but before he had harvested it. *Wickard* v. *Filburn*, 317 U.S. 111, 132–33 (1942). However, even if it is argued that Section 10 does have retroactive effect, this aspect of the legislation creates no difficulties under either the Takings or Due Process Clauses of the Fifth Amendment. U.S. Const. amend. V.

Andrus v. *Allard*, 444 U.S. 51 (1979), demonstrates that Section 10 does not constitute a compensable "taking" of chips manufactured prior to the Act's effective date. In *Andrus*, several sellers of Indian artifacts challenged Interior Department regulations which prohibited commercial transactions in certain species of birds. The regulations specifically applied their transactional bans to persons who had lawfully acquired birds prior to the effective date of the statutes. Initially construing the statutes under attack to authorize the regulations, the Supreme Court then held that those statutes as interpreted did not constitute compensable takings. The *Andrus* Court explained the basis for its holding:

> The regulations challenged here do not compel the surrender of the artifacts, and there is no physical invasion or restraint upon them. Rather, a significant restriction has been imposed on one means of disposing of the artifacts. But the denial of one traditional property right does not always amount to a taking . . .
>
> It is, to be sure, undeniable that the regulations here prevent the most profitable use of appellees' property. Again, however, that is not dispositive. When we review regulation, a reduction in the value of property is not necessarily equated with a taking . . .

Id. at 65–66 (citations omitted).

As Justice Marshall noted, other Supreme Court decisions have also rejected Takings Clause challenges to statutes prospectively prohibiting the sale of previously manufactured goods:

> Regulations that bar trade in certain goods have been upheld against claims of unconstitutional taking. For example, the Court has sustained regulations prohibiting the sale of alcoholic beverages despite the fact that individuals were left with previously acquired stocks. *Everard's Breweries* v. *Day*, 265 U.S. 545 (1924), involved a federal statute that forbade the sale of liquors manufactured before passage of the statute. The claim of a taking in violation of the Fifth Amendment

> was tersely rejected. *Id.*, at 563. Similarly, in *Jacob Ruppert, Inc.* v. *Caffey*, 251 U.S. 264 (1920), a federal law that extended a domestic sales ban from intoxicating to nonintoxicating alcoholic beverages "on hand" at the time of the passage of the act," *id.*, at 302, was upheld. Mr. Justice Brandeis dismissed the takings challenge, stating that "there was no appropriation of private property, but merely a lessening of value due to a permissible restriction imposed upon its use." *Id.*, at 303. *See Mugler* v. *Kansas*, 123 U.S. 623 (1887).

Id. at 467. *Andrus* and the authorities on which it relies establish that Section 10 merely regulates the use of pirated chips and does not constitute a compensable taking.

It is questionable whether Section 10 presents a due process question which is analytically distinct from the taking issue. In *Andrus*, the merchants had presented their constitutional arguments to the lower courts in terms of "economic substantive due process." The Supreme Court permitted the merchants to restyle their arguments in "the terminology of the Takings Clause," apparently deeming the two Fifth Amendment clauses to be interchangeable. 444 U.S. at 64 n.21. However, even if a separate due process test applies to Section 10, the legislation plainly satisfies it.

In a recent case addressing a Fifth Amendment due process challenge to a retroactive Federal statute, the Supreme Court generally observed:

> It is by now well established that legislative Acts adjusting the burdens and benefits of economic life come to the Court with a presumption of constitutionality, and that the burden is on one complaining of a due process violation to establish that the legislature has acted in an arbitrary and irrational way...
>
> To be sure, ... the Act has some retrospective effect... But our cases are clear that legislation readjusting rights and burdens is not unlawful solely because it upsets otherwise settled expectations. This is true even though the effect of the legislation is to impose a new duty or liability based on past acts.

Usery v. *Turner Elkhorn Mining Co.*, 428 U.S. 1, 15–16 (1976) (citations omitted) (upholding legislation requiring certain mine owners to provide Black Lung benefits to former employees who had left the owners' employ before enactment of the statute). *Cf. United States Trust Co.* v. *New Jersey*, 431 U.S. 1, 17 n.13 (1977) (the Fourteenth Amendment "generally does not prohibit retrospective civil legislation, unless the consequences are particularly 'harsh and oppressive'") (quoting *Welsh* v. *Henry*, 305 U.S. 134, 147 (1938)).

The Supreme Court has never articulated an explicit standard for evaluating retroactive legislation under the Fifth Amendment's Due Process Clause, and its decisions reflect a variety of factors. *See generally* Hochman, *The Supreme Court and the Constitutionality of Retroactive Legislation*, 73 Harv. L. Rev. 692, 696–97 (1960). Several elements present in decisions validating retroactive Federal legislation exist here. First, the bill clearly serves a significant public interest. *See*

generally id. at 697–703. Second, the property "right" modified by Section 10, the sale of pirated semiconductor chips, rests upon an "insubstantial equity." *See generally id.* at 720–22. Finally, Section 10 only affects the activities of pirates who commenced distributing their chips on or after January 1, 1980. Section 10's durational scope thus closely resembles the limited reach of retroactive income tax statutes, which the Supreme Court has consistently upheld. *See, e.g., United States* v. *Darusmont*, 449 U.S. 292, 297 (1981) (per curium).

In the Committee's view, the effective date provision also involves a fairness question. If copist or pirates had something similar to a vested right to continue their copying indefinitely, it might seem appropriate that protection for chips only apply to chips hereafter created. However, copyists have been on notice since legislation was proposed in the 96th Congress that the Congress was concerned about piracy. Since that time, indeed in the last year, a number of commercially important new chips have come on the market. These chips, such as 256K Random Access Memories and advanced 16-and 32-bit microprocessors, embody important technological breakthroughs that deserve protection against piracy. The Committee believes that it would be unfair to the innovators of such new chips not to terminate after enactment of this legislation continuing acts of piracy, whenever initiated.

U.S. Department of Commerce,
Patent and Trademark Office,
Washington, D.C.

Hon. Charles McC. Mathias, Jr.,
Chairman, Subcommittee on Patents, Copyrights and Trademarks, Committee on the Judiciary, U.S. Senate, Washington, D.C.

Dear Mr. Chairman: I have been following with great interest your efforts to develop an appropriate form of protection for semiconductor chip designs (S. 1201). Being aware of your Subcommittee's unanimous approval of an amended version of S. 1201 on November 15, I wanted to report to you the Administration's position on this important subject, which is fully supportive of the action taken by the Subcommittee.

As you know, the Cabinet Council on Commerce and Trade (CCCT) established a Working Group on Intellectual Property to develop policy options on a number of important intellectual property issues. Recognizing the importance of the semiconductor industry to the U.S. economy, the CCCT directed the Working Group to consider the need to protect semiconductor chip designs. It found that while the United States dominates this important market, it faces a serious challenge from foreign competition. It also found that the R&D costs for a single complex chip could reach $4 million, while the costs of copying such a chip could be less than $100,000. This constitutes a significant disincentive for creators to invest in this technology.

There are no effective legal means of stopping the copying of chips under existing U.S. laws. While a patent would protect against the manufacture, use and sale of the electronic circuitry embodied in a semiconductor chip, the circuits actually placed on chips frequently do not satisfy the patentability requirements of being "new, useful and unobvious."

On the basis of these considerations, the CCCT recommended that the Administration endorse protection for the creators of this valuable technology. Specifically, the CCCT recommended the prompt enactment of legislation protecting semiconductor chip designs and that such legislation have the following characteristics:

(1) It should accord prompt, inexpensive protection to original semiconductor chip designs through a registration system without substantive examination.

(2) The protection should grant to the owner of the chip design the exclusive right to copy, for commercial purposes, the chip design, or chip embodied in that design, as well as the exclusive right to distribute such a chip.

(3) The protection should be relatively short term, e.g., ten years.

(4) As an exception to the exclusive rights, there should be an express right to reverse engineer—for the purpose of teaching, analyzing or evaluating—the concepts or techniques embodied in the design of the semiconductor chip.

(5) Unless there are overriding circumstances to the contrary, the protection should be prospective from the current time.

The prompt enactment of legislation along these lines would materially assist U.S. industry by providing protection for this valuable and important new technology. I would be pleased to discuss the recommendations of the CCCT in greater detail with you or your staff and to assist the Subcommittee in any way I can.

Sincerely,

GERALD J. MOSSINGHOFF,
Assistant Secretary and Commissioner of Patents and Trademarks.

IX. ADMINISTRATION POSITION

The Administration is fully supportive of S. 1201, as evidenced by the following letter communicating the recommendations of the Cabinet Council on Commerce and Trade with respect to protection of semiconductor chip designs:

X. REGULATORY IMPACT STATEMENT

In compliance with paragraph 11(b), Rule XXVI, of the Standing Rules of the Senate, the Committee has concluded that the bill will have no significant regulatory impact or impact on personal privacy. Enactment of the bill would not create any significant additional paperwork.

XI. COST OF THE LEGISLATION

In accordance with paragraph 1(a), Rule XXVI, of the Standing Rules of the Senate, the Committee offers the following report of the Congressional Budget Office:

U.S. CONGRESS,
CONGRESSIONAL BUDGET OFFICE,
Washington, D.C., April 26, 1984.

Hon. STROM THURMOND,
Chairman, Committee on the Judiciary,
U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: The Congressional Budget Office has reviewed S. 1201, the Semiconductor Chip Protection Act of 1984, as ordered reported by the Senate Committee on the Judiciary, April 5, 1984. We estimate that enactment of this bill will cost the federal government about $200,000 per year for the next three years, and less thereafter.

S. 1201 amends the copyright laws to allow the protection of mask works on semiconductor ships from unauthorized duplication. Owners of mask works can receive a 10-year copyright. The bill provides protection from liability for innocent purchasers of semiconductor chip products that infringe on the rights of the copyright holder. Protection from liability is also provided for any infringer who continues to manufacture or to distribute semiconductor chips which he commercially distributed in the United States prior to January 1, 1980.

Based on information provided by the Copyright Office, we expect some costs to be incurred for conversion of existing computer software and for processing of copyright applications. These costs are expected to be about $200,000 per year in fiscal years 1985 through 1987, and less than $100,000 annually thereafter.

No costs will be incurred by state or local governments as a result of the enactment of this bill.

If you wish further details on this estimate, we will be pleased to provide them.

Sincerely,

RUDOLPH G. PENNER.

XII. CHANGES IN EXISTING LAW

In compliance with paragraph 12 of Rule XXVI, of the Standing Rules of the Senate, changes in existing law made by S. 1201 as reported are shown as follows (existing law proposed to be omitted is enclosed in brackets, new matter is printed in italic, and existing law in which no change is proposed is shown in roman):

UNITED STATES CODE

TITLE 17.—COPYRIGHTS

* * * * * * *

CHAPTER 1—SUBJECT MATTER AND SCOPE OF COPYRIGHT

Sec.
101. Definitions.
102. Subject matter of copyright: In general.
103. Subject matter of copyright: Compilations and derivative works.
104. Subject matter of copyright: National origin.

105. Subject matter of copyright: United States Government works.
106. Exclusive rights in copyrighted works.
107. Limitations on exclusive rights: Fair use.
108. Limitations on exclusive rights: Reproduction by libraries and archives.
109. Limitations on exclusive rights: Effect of transfer of particular copy or phonorecord.
110. Limitations on exclusive rights: Exemption of certain performances and displays.
111. Limitations on exclusive rights: Secondary transmissions.
112. Limitations on exclusive rights: Ephemeral recordings.
113. Scope of exclusive rights in pictoral, graphic, and sculptural works.
114. Scope of exclusive rights in sound recordings.
115. Scope of exclusive rights in nondramatic musical works: Compulsory license for making and distributing phonorecords.
116. Scope of exclusive rights in nondramatic musical works: Public performances by means of coin-operated phonorecord players.
117. Scope of exclusive rights: Use in conjunction with computers and similar information systems.
118. Scope of exclusive rights: Use of certain works in connection with noncommercial broadcasting.
119. Scope of exclusive rights: Right of reverse engineering with respect to mask works.

§ 101. Definitions

As used in this title, the following terms and their variant forms mean the following:

* * * * * * *

A "semiconductor chip product" is the final or intermediate form of a product—

(1) having two or more layers of metallic, insulating, or semiconductor material, deposited or otherwise placed on, or etched away or otherwise removed from a piece of semiconductor material in accordance with a predetermined pattern;

(2) intended to perform electronic circuitry functions; and

(3) that is a writing, or the manufacture, use, or distribution of which is in or affects commerce.

A "mask work" is a series of related images, however fixed or encoded

(1) having the predetermined, three-dimensional pattern of metallic, insulating, or semiconductor material present or removed from the layers of a semiconductor chip product; and

(2) in which series the relation of the images to one another is that each image has the pattern of the surface of one form of the semiconductor chip product.

A "mask" is a substantially two-dimensional sheet, partially transparent and partially opaque to preselected radiation. A mask embodies a mask work if the pattern of transparent and opaque portions of the mask is substantially similar to the pattern of one of the images of the mask work. Masks and mask works shall not be deemed pictorial, graphic, or sculptural works. The copyright in a mask work shall neither extend to, nor affect, limit, or impair any copyright in any other work of authorship embodied therein or in a semiconductor chip product.

The provisions of sections 109(a), 401, 405, 406, 501(A), 503, 506, 509, and 602 of this title, applicable to copies of a work shall apply also to semiconductor chip products.

§ 102. Subject matter of copyright: In general

(a) Copyright protection subsists, in accordance with this title, in original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device. Works of authorship include the following categories:

(1) literary works;
(2) musical works, including any accompanying words;
(3) dramatic works, including any accompanying music;
(4) pantomimes and choreographic works;
(5) pictorial, graphic, and sculptural works;
(6) mask works;
[(6)] *(7)* motion pictures and other audiovisual works; and
[(7)] *(8)* sound recordings.

(b) In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.

§ 106. Exclusive rights in copyrighted works

Subject to sections 107 through [118] *119*, the owner of copyright under this title has the exclusive rights to do and to authorize any of the following:

(1) to reproduce the copyrighted work in copies or phonorecords;

(2) to prepare derivative works based upon the copyrighted work;

(3) to distribute copies or phonorecords of the copyrighted work to the public by sale or other transfer of ownership, or by rental, lease, or lending;

(4) in the case of literary, musical, dramatic, and choreographic works, pantomimes, and motion pictures and other audiovisual works, to perform the copyrighted work publicly; [and]

(5) in the case of literary, musical, dramatic, and choreographic works, pantamomies, and pictorial, graphic, or sculptural works, including the individual images of a motion picture or other audiovisual work, to display the copyrighted work publicly[.] *; and*

(6) in the case of mask works, only the following rights—

(A) to embody the mask work in a mask;

(B) to distribute a mask embodying the mask work;

(C) to embody an image of the mask work in a semiconductor chip product;

(D) in the manufacture of a semiconductor chip product, substantially to reproduce, by optical, electronic, or other means, an image of the mask work on material intended to be part of the semiconductor chip product; and

(E) to distribute a semiconductor chip product made as described in subparagraph (C) or (D) of this paragraph.

* * * * * * *

§ *119. Scope of exclusive rights: Right of reverse engineering with respect to mask works*

(a) In the case of mask works, the exclusive rights provided by section 106 are subject to a right of reverse engineering use under the conditions specified by this section.

(b) It is not infringement of the rights of the owner of a copyright on a mask work to reproduce the pattern on one or more masks or in a semiconductor chip product solely for the purpose of teaching, analyzing, or evaluating the concepts or techniques embodied in the mask or semiconductor chip product, or the circuit schematic, logic flow, or organization of components utilized therein.

* * * * * * *

CHAPTER 3—DURATION OF COPYRIGHT

Sec.
301. Preemption with respect to other laws.
302. Duration of copyright: Works created on or after January 1, 1978.
303. Duration of copyright: Works created but not published or copyrighted before January 1, 1978.
304. Duration of copyright: Subsisting copyrights.
305. Duration of copyright: Terminal date.

* * * * * * *

§ 302. Duration of copyright: Works created on or after January 1, 1978

* * * * * * *

(f) MASKS.—Copyright in mask works endures for a term of ten years from the earliest of first authorized—

(1) distribution;

(2) use in a commercial product; or

(3) manufacture in commercial quantities of semiconductor chip products made as described in subparagraph (C) or (D) of paragraph (6) of section 106.

* * * * * * *

CHAPTER 5—COPYRIGHT INFRINGEMENT AND REMEDIES

Sec.
501. Infringement of copyright.
502. Remedies for infringement: Injunctions.
503. Remedies for infringement: Impounding and disposition of infringing articles.
504. Remedies for infringement: Damage and profits.
505. Remedies for infringement: Costs and attorney's fees.
506. Criminal offenses.
507. Limitatioins on actions.
508. Notification of filing and determination of actions.
509. Seizure and forfeiture
510. Remedies for alteration of programing by cable systems.
511. Innocent infringement of mask works.

* * * * * * *

§ 503. Remedies for infringement: Impounding and disposition of infringing articles

(a) At any time while an action under this title is pending, the court may order the impounding, on such terms as it may deem reasonable, of all copies or phonorecords claimed to have been made or used in

violation of the copyright owner's exclusive rights, and of all plates, molds, matrices, masters, tapes, film negatives, *masks*, or other articles by means of which such copies or phonorecords may be reproduced.

(b) As part of a final judgment or decree, the court may order the destruction or other reasonable disposition of all copies or phonorecords found to have been made or used in violation of the copyright owner's exclusive rights, and of all plates, molds, matrices, masters, tapes, film negatives, *masks*, or other articles by means of which such copies or phonorecords may be reproduced.

* * * * * * *

§ 509. Seizure and forfeiture

(a) All copies or phonorecords manufactured, reproduced, distributed, sold, or otherwise used, intended for use, or possessed with intent to use in violation of section 506(a), and all plates, molds, matrices, masters, tapes, film negatives, *masks*, or other articles by means of which such copies or phonorecords may be reproduced, and all electronic, mechanical, or other devices for manufacturing, reproducing, or assembling such copies or phonorecords may be seized and forfeited to the United States.

(b) The applicable procedures relating to (i) the seizure, summary and judicial forfeiture, and condemnation of vessels, vehicles, merchandise, and baggage for violations of the customs laws contained in title 19, (ii) the disposition of such vessels, vehicles, merchandise, and baggage or the proceeds from the sale thereof, (iii) the remission or mitigation of such forfeiture, (iv) the compromise of claims, and (v) the award of compensation to informers in respect of such forfeitures, shall apply to seizures and forfeitures incurred, or alleged to have been incurred, under the provisions of this section, insofar as applicable and not inconsistent with the provisions of this section; except that such duties as are imposed upon any officer or employee of the Treasury Department or any other person with respect to the seizure and forfeiture of vessels, vehicles, merchandise; and baggage under the provisions of the customs laws contained in title 19 shall be performed with respect to seizure and forfeiture of all articles described in subsection (a) by such officers, agents, or other persons as may be authorized or designated for that purpose by the Attorney General.

* * * * * * *

§ 511. Innocent infringement of mask works

(a) Notwithstanding any other provision of this chapter, an innocent purchaser of an infringing semiconductor chip product shall not be liable as an infringer or otherwise be liable or subject to remedies under this chapter with respect to the distribution of units of such semiconductor chip product that occurred before such innocent purhaser had notice of infringement.

(b) The remedies of the owner of a copyright on a mask work against an innocent purchaser shall be limited to a reasonable royalty upon each unit of the infringing semiconductor chip product that the innocent purchaser made or distributed after having notice of in-

fringement, if the innocent purchaser establishes the applicability of all of the following circumstances:

(1) the innocent purchaser, before first having notice of infringement, committed substantial funds to the use of the infringing product;

(2) the innocent purchaser would suffer substantial out-of-pocket losses (other than the difference in price between the infringing product and a noninfringing product) if denied the use of the infringing product;

(3) the innocent purchaser's use of the infringing product is and will be for substantially the same purpose that initially gave rise to the innocent purchaser's immunity under subsection (a);

(4) in the case of an innocent purchaser who, after having notice of infringement, makes the infringing semiconductor chip product, or has it made for him, the copyright owner and the owner's licensees, if any, are unable to supply the infringing semiconductor chip product to the innocent purchaser at a reasonable price; and

(5) it would be inequitable in the circumstances not to permit the innocent purchaser to continue the use or proposed use of the infringing product.

(c) The immunity of an innocent purchaser and limitation of remedies with respect thereto shall extend to good faith purchasers from him.

(d) For the purposes of this section—

(1) "innocent purchaser" means one who purchases an infringing semiconductor chip product in good faith, and without having notice of infringement;

(2) "notice of infringement" means actual knowledge that, or reasonable grounds to believe that, a product is an infringing semiconductor chip product; and

(3) "infringing semiconductor chip product" means a semiconductor chip product which is made or distributed in violation of the exclusive rights of an owner of a copyright in a mask work.

○