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UNITED STATES TARIFF COMMISSION

CAPACITORS AND SEMICONDUCTORS:
FORMER WORKERS OF THE SPRAGUE ELECTRIC COMPANY
PLANTS AT--

North Adams, Mass.
Worcester, Mass.
Hillsville, Va.
Lansing, N. C.
Concord, N. H.
Barre, Vt.
Grafton, Wis.

Report to the President on Worker Investigations No. TEA-W-82 through 88 Under
Section 301(c)(2) of the Trade Expansion Act of 1962



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UNITED STATES TARIFF COMMISSION

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Note.--The whole of the Commission's report to the President may not be made public since it contains certain information that could result in the disclosure of the operations of an individual concern. This published report is the same as the report to the President, except that the above-mentioned information has been omitted. Such omissions are indicated by asterisks.

REPORT TO THE PRESIDENT

U.S. Tariff Commission,
May 14, 1971.

To the President:

In accordance with section 301(f)(1) of the Trade Expansion Act of 1962 (76 Stat. 885), the U.S. Tariff Commission herein reports the results of investigations made under section 301(c)(2) of that act relating to groups of workers engaged in the production of certain capacitors, transistors, and integrated circuits.

On March 15, 1971, the Commission received individual petitions filed on behalf of certain workers employed at seven establishments of the Sprague Electric Company, North Adams, Mass.--located at North Adams Mass.; Worcester, Mass.; Hillsville, Va.; Lansing, N.C.; Concord, N.H.; Barre, Vt.; and Grafton, Wis. (Sprague of Wis., Inc.). The petitions were applications for adjustment assistance under the Trade Expansion Act. On March 29, 1971 the Commission instituted investigations (TEA-W-82 through 88) to determine whether, as a result in major part of concessions granted under trade agreements, articles like or directly competitive with the capacitors, transistors, and integrated circuits produced in the seven establishments are being imported into the United States in such increased quantities as to cause, or threaten to cause, the unemployment or underemployment of a significant number or proportion of the workers.

Public notice of the investigations was published in the Federal Register (36 F.R. 6124) on April 2, 1971. No public hearing was requested, and none was held.

The information in this report was obtained chiefly from the petitioners, other domestic producers of capacitors, transistors, and integrated circuits, domestic producers of end products in which the named components are used, the Electronic Industries Association, and the Commission's files.

Findings of the Commission

On the basis of its investigations, the Commission 1/ finds (Commissioner Moore dissenting) that articles like or directly competitive with the capacitors, transistors, and integrated circuits produced by the establishments of the Sprague Electric Company located at North Adams, Mass.; Worcester, Mass.; Hillsville, Va.; Lansing, N.C.; Concord, N.H.; Barre, Vt.; and Grafton, Wis. (Sprague of Wis., Inc.) are not, as a result in major part of concessions granted under trade agreements, being imported into the United States in such increased quantities as to cause, or threaten to cause the unemployment or underemployment of a significant number or proportion of the workers.

1/ Commissioner Clubb did not participate in the decisions. Commissioner Young joined in the Commission majority in the investigation relating to the workers at Sprague of Wis., Inc., located at Grafton, Wis. (Inv. No. TEA-W-88), but he did not participate in the other investigations.

Views of Presiding Commissioner Sutton
and Commissioner Leonard

These investigations relate to petitions filed on behalf of the workers at seven plants of the Sprague Electric Company, North Adams, Massachusetts, for a determination under section 301(c)(2) of the Trade Expansion Act of 1962 of their eligibility to apply for adjustment assistance. Our determination is in the negative. Our reasons for this decision are the same as those set forth in the Commission's report relating to a petition for adjustment assistance filed by the Sprague Electric Company, 1/ which is being released concurrently with this report.

1/ Capacitors and Semiconductors: Sprague Electric Company . . . ,
Investigation No. TEA-W-22, TC Publication 394, May 1971.

Dissenting Views of Commissioner Moore

It is my opinion that affirmative determinations should be made in these seven cases, by reason of the fact that the requirements of section 301(c)(2) of the Trade Expansion Act of 1962 have been met. The workers concerned have been employees at seven plants of the Sprague Electric Company; most have been engaged in the manufacture of capacitors, while some have been engaged in the production of transistors and integrated circuits.

The Tariff Commission has frequently ruled that the Trade Expansion Act provides four requirements for an affirmative determination in worker cases:

1. Imports of articles like or directly competitive with those produced by the workers must be increasing;
2. The increased imports must be a result in major part of concessions granted under trade agreements.
3. A significant number or proportion of the workers at the plants concerned must be unemployed or underemployed or threatened therewith; and
4. The increased imports resulting in major part from trade-agreement concessions must be the major factor causing or threatening to cause the unemployment or underemployment.

Increased imports as a result in major part of trade-agreement concessions

It is evident that U.S. imports of capacitors, transistors, and integrated circuits have increased (both separately and as integral parts of finished products) and that the increased imports are due in major part from concessions granted under trade agreements. My reasons for so concluding are set forth in Capacitors and Semiconductors: Sprague

Electric Company, 1/ a report being issued concurrently by the Commission on a petition by that firm for a determination of its eligibility to apply for adjustment assistance. Both the first and second requirements thus have been met.

Unemployment or underemployment

The requirement that a significant number or proportion of the workers at each plant concerned must be unemployed or underemployed is clearly met. Employment afforded workers at each of the plants has declined appreciably during the past 3 years, as shown in the following table.

* * * * *

The conclusion is evident. Appreciable layoffs have occurred at each of the plants, and a significant number of the workers are unemployed.

Major factor

The previous requirements having been met, the final requirement is that the imports resulting in major part from tariff concessions must be the major factor causing the unemployment. This requirement is satisfied if, in the absence of increased imports of the articles concerned (separately and in finished products), the unemployment would not have occurred.

1/ Capacitors and Semiconductors: Sprague Electric Company, Inv. No. TEA-F-22 (1971).

In the report on the concurrent firm investigation, 1/ I set forth the reasons why the concession-generated increased imports of capacitors, transistors, and semiconductors were the major factor threatening serious injury to the Sprague Electric Company. Those same reasons are pertinent here to the decision that such increased imports have been the major factor causing significant unemployment in each group of petitioning workers.

Conclusion

Since the requirements of the act have all been met, I have made an affirmative determination.

1/ Ibid.

INFORMATION OBTAINED IN THE INVESTIGATION

Description and uses

The articles which are the subject of the Sprague Electric Company petition include seven specific types of fixed capacitors and two types of semiconductor devices. The specific types of capacitors named are metal case tubular aluminum electrolytic, small can twist-prong aluminum electrolytic, ceramic disc, paper dielectric nonmetal case, film dielectric nonmetal case, metallized dielectric nonmetal case, and dual-dielectric nonmetal case. The specific semiconductors named are transistors and silicon monolithic integrated circuits.

Capacitors.--A capacitor is a device used to store electrical energy. It is composed of two conductors of electrical energy (plates) separated by a nonconducting material (dielectric). When a voltage is applied between the two plates (acting as electrodes), passage of electrons through the dielectric is restricted and they collect at one dielectric-electrode interface. The measure of the capacitor's ability to store electrical energy is its capacitance, expressed in microfarads and picofarads (one-millionth of a microfarad, formerly micro-microfarads). Capacitance increases as the ratio of plate area to dielectric increases, thus the thinner the dielectric, the higher the capacitance. A capacitor is designed to a specific voltage rating, indicating the maximum voltage it can withstand without being destroyed.

Most capacitors are fixed, that is, the rated capacitance cannot be altered at will. Some capacitors, however, are variable, that is,

the capacitance can be altered by means of a screw, as in trimmers, or by turning a rod, as in tuning capacitors.

Capacitors are made of various materials, the choice of materials depending on the specific capacitance, voltage rating, and degree of dependability required. The types of capacitors are generally designated by the dielectric material used; sub-types reflect differences in such features as configuration, method of attachment and covering material.

Aluminum electrolytic capacitors are usually made for use in DC (direct current) circuits. The DC capacitor consists of two sheets of aluminum foil, one of which has a coating of aluminum oxide, separated by paper impregnated with a wet electrolyte. The coated foil is the anode or positive plate (electrode) of the device, the aluminum oxide coating is the dielectric, and the electrolyte-impregnated paper backed by the second sheet of foil form the cathode or negative plate. The sandwich is rolled up, giving it a tubular appearance, and encased in metal or a non-metal; it has wire leads for both anode and cathode. A multisection electrolytic capacitor has two to four anodes in one unit using a common cathode, and takes the place of as many capacitors as it has anodes; this type of capacitor is generally the twist-prong (also called twist-lug or twist-tab) type, the prongs permitting simple and secure attachment to the chassis of the electronic equipment in which it is used. For AC (alternating current) use, such as AC electric motor starts, the capacitor basically consists of two DC aluminum electrolytic capacitor assemblages back-to-back. Aluminum electrolytic capacitors have high values of capacitance for their size, and are used principally

at audio frequencies for bypass purposes and in power supplies for filtering purposes.

Ceramic capacitors are of several types, but basically they are composed of a ceramic dielectric thinly coated on each side with silver which forms the conductors or electrodes. The ceramic disc capacitor is the most common type, the name describing its shape. Ceramic capacitors usually have very low values of capacitance and are used at high radio frequencies for coupling and bypass purposes.

Paper capacitors use paper impregnated with dielectric liquids as the dielectric, the metal foil plates and the dielectric being rolled into a tube and encased in metal or plastic.

Film capacitors utilize thin plastic films made of various polymers, instead of impregnated paper, as the dielectric. Metallized dielectric and dual dielectric capacitors are modifications and combinations of the paper and film capacitors; in metallized dielectric capacitors, thin coatings of metal deposited directly on the dielectric serve as the plates. For many applications, the four types of capacitors using paper and film dielectrics are interchangeable. As used in power plants, these capacitors may be room sized, whereas for consumer electronic use, as in television sets and radios, they may be quite small.

Tantalum electrolytic capacitors may be used in lieu of aluminum electrolytic capacitors at the lower voltages, but they are more expensive and are used mainly for military purposes because of a reputation for greater dependability. Mica, glass, and vitreous enamel capacitors can be used for the same purposes as ceramic capacitors, but are more expensive. Paper and film capacitors have a very wide range of use, both as to capacitance and voltage.

In most cases, the specific conditions of usage, such as temperature, humidity, required durability, and available space determine the specific type of capacitor to be used in any particular application, in addition to price.

Semiconductors.--A semiconductor is a device used in an electronic circuit to conduct, rectify, or otherwise control a current for various purposes, the specific function depending on the properties of the material used and the manufacturing process. It is usually made of a single crystal of a metallic element, such as silicon or germanium, into which a minute quantity (1 or 2 parts per million) of an impurity (such as arsenic or antimony) is introduced to create a layered effect within the crystal. The performance of semiconductors is based on the principle that the differential flow of current through dissimilar materials creates a specific reaction at the interface or junction of the materials; control of polarity and of the voltage applied to the current will control the reaction. Semiconductors are very much smaller and require much less electrical energy than the electronic components they have replaced.

Transistors are semiconductors which amplify electrical signals. Various types are made for different functions. They may be made with wire leads for mounting on the circuit chassis or with metal bases for direct attachment to the chassis. The chassis mounted type is intended for power use at 1 watt or over. The lead mounted transistors are generally made for use at less than 1 watt,

although some are made for higher wattage performance. To a large extent, transistors have supplanted vacuum electronic tubes.

Integrated circuits consist of some of the components of an electronic circuit, such as transistors, capacitors, and resistors, but all are inseparable in one very small thin mass, performing the function of an electronic circuit by means of semiconductor principles. Silicon monolithic integrated circuits are the principal type made. Generally, many monolithic integrated circuits are made at the same time from one wafer of silicon within which the numerous circuit components are created by means of a multistep process involving photographic etching and selective diffusion of impurities. On completion of this process, the individual integrated circuits on the single wafer of silicon are separated. External connections are attached to these circuit "chips," and the units are encapsulated. The individual circuits are very small and the work must be performed under microscopes. Other types of integrated circuits utilize various materials and processes, and may incorporate discrete semiconductor chips. Integrated circuits supplant entire electronic circuit assemblages which might include many vacuum tubes, transistors, resistors, capacitors, interconnecting wires, housings, and brackets.

U.S. tariff treatment

All capacitors are dutiable as "electrical capacitors" under item 685.80 of the Tariff Schedules of the United States. The rate of duty is currently 10 percent ad valorem, which is 71 percent less than the statutory rate of 35 percent established under the Tariff Act of 1930. (If of Canadian origin and intended for use as original equipment in the manufacture in the United States of a motor vehicle, capacitors may be entered free of duty under item 685.81.)

Transistors and integrated circuits are dutiable under item 687.60 at 7 percent ad valorem, which is 80 percent less than the statutory rate of 35 percent ad valorem. (If of Canadian origin and intended for use as original equipment in the manufacture in the United States of a motor vehicle, transistors and integrated circuits may be entered free of duty under item 687.61.) The intermediate rates established by various trade agreements, and the reduction scheduled under the Kennedy Round of the General Agreement on Tariffs and Trade (GATT), are indicated in the following table:

Capacitors and semiconductors: U.S. tariff rate history, 1930-72

(Rate in percent ad valorem)

Tariff Act or Trade Agreement	Effective date	Capaci- tors 1/ (TSUS item 685.80)	Semiconductors 1/ (TSUS item 687.60)
Tariff Act of 1930-----	June 1930	35	35
Bilateral Agreement with United Kingdom-----	Jan. 1939	25	25
GATT, Geneva-----	Jan. 1948	15	15
GATT, Torquay-----	June 1951	12-1/2	12-1/2
TSUS-----	Aug. 1963	12-1/2	12-1/2
GATT, Kennedy Round-----	Jan. 1968	12	11
	: Jan. 1969	: 11	: 10
	: Jan. 1970	: 11	: 8.5
	: Jan. 1971	: 10	: 7
	: Jan. 1972	: 10	: 6
	:	:	:

1/ Included as radio apparatus until August 31, 1963.

The duties on the principal articles which incorporate capacitors, transistors, and integrated circuits of the types cited by Sprague were 35 percent to 40 percent ad valorem in 1930 but have been reduced considerably as a result of negotiations under the GATT. Articles of major importance in the entertainment market, including television and radio receivers, phonographs, and tape recorders, were all dutiable at 35 percent ad valorem in 1930, but now the tariff rates range from 6 percent to 10.4 percent ad valorem, reductions of 83 percent to 70 percent. Commercial articles of major importance included calculators, computers, and other data processing machines, and certain electrical measuring, checking, analyzing or automatically-controlling instruments and apparatus; duties on these articles in 1930 of 35 percent to 40 percent ad valorem were lowered to a current range of 6 percent to 10 percent ad valorem, reductions of 83 to 75 percent.

U.S. consumption and shipments

Capacitors.--Annual consumption dropped sharply in 1967 * * * from * * * 1966 * * *; it rose * * * through 1969, but then dropped * * * in 1970 (appendix table 1, page Z-1). Apparent annual consumption of the major categories of fixed capacitors--electrolytic, paper and film, ceramic, and other--generally followed the same fluctuations (appendix tables 3, 4, 5, and 6 on pages Z-4 through Z-7).

* * * * *

U.S. producers' shipments fluctuated with consumption (appendix table 2, page Z-2). The share of the total value of U.S. consumption of fixed capacitors supplied from domestic production during 1966-70 declined * * *.

Transistors.--Annual U.S. consumption of transistors fluctuated widely during 1966-70. Consumption declined from * * * 1966 to * * * 1967, rose * * * in 1969 but then dropped severely * * * in 1970 (appendix table 7, page Z-8).

U.S. producers' shipments experienced a strong downward trend during 1966-70 (appendix table 8, page Z-9). The share of total U.S. consumption of transistors, by quantity, supplied from domestic production decreased from * * * 1966 to * * * 1970. The decline is attributed largely to extensive use of foreign manufacturing facilities by U.S. producers and the importation of transistors under TSUS items 806.30 and 807.00.

Integrated circuits.--The value of U.S. consumption of integrated circuits increased rapidly from * * * 1967 to * * * 1970. Data on consumption by quantity were available for 1970 only (appendix table 9, page Z-10). The share of the total value of consumption of integrated

circuits supplied from U.S. production declined despite an increased value of shipments of domestically produced units. In 1967, * * * percent of consumption was represented by domestically produced units, in 1970, * * * percent. The decline is attributed largely to the increased use of foreign manufacturing facilities by U.S. firms and the importation of integrated circuits under TSUS item 806.30.

U.S. imports

All fixed capacitors.—The value of U.S. imports of fixed capacitors increased from * * * 1966 to * * * 1970 (appendix table 10, page Z-11). The value of imports from Japan, the principal source, generally declined * * *. The bulk of the increase in the value of imports of fixed capacitors is attributed to imports from Mexico and Taiwan where U.S. firms utilized foreign facilities to process capacitors prior to importation into the United States under TSUS items 806.30 or 807.00.

U.S. imports of fixed capacitors dutiable under the regular provisions of the TSUS rose from * * * 1966 to * * * 1970; entries dutiable under the provisions of items 806.30 and 807.00 rose from * * * 1966 to * * * 1970. The share of the total value of imports of fixed capacitors entered under items 806.30 and 807.00 increased from 1.3 percent in 1966 to 27.6 percent in 1970. In 1970, 806.30/807.00 imports from Mexico accounted for 13.6 percent of the total value of imports and those from Taiwan, 6.7 percent (appendix table 11, page Z-12).

* * * * *

Semiconductors and parts.--The total value of U.S. imports of semi-conductors (including transistors and integrated circuits) and parts increased from \$50.2 million in 1966 to \$189.3 million in 1970. The great bulk of the value of imports is attributed to less developed countries (LDC's) such as Mexico, Hong Kong, Korean Republic, Singapore, Ireland, and Taiwan.

Virtually all semiconductors imported from LDC's are entered into the United States under the provisions of items 806.30 and 807.00. In 1970, imports of semiconductors (largely transistors) under item 807.00 accounted for 66 percent of the total value of imports of semiconductors and parts, and imports under item 806.30 (principally integrated circuits) accounted for an additional 17 percent of the total (appendix table 16, page Z-17).

The total value of U.S. imports of transistors declined from 1966 to 1967 and then increased to \$59.8 million in 1970. Mexico and Hong Kong were the principal sources (appendix table 17, page Z-18).

The total value of U.S. imports of transistors increased rapidly, while U.S. producers' shipments * * * declined, using 1966 as a base year, as shown below.

* * * * *

The total value of U.S. imports of integrated circuits was \$69.4 million in 1970, the only year for which official statistics are available. According to trade sources, imports of integrated circuits rose rapidly from \$4.0 million in 1967 to \$30.0 million in 1969.

The value of imports of semiconductors (including integrated circuits) other than transistors and parts thereof increased from \$21.5 million in 1966 to \$129.6 million in 1970 (appendix table 18, page Z-19). The Korean Republic, Singapore, Hong Kong, and Mexico were the four principal sources.

Although the value of U.S. imports of integrated circuits is estimated to have increased much more rapidly than U.S. producers' shipments, domestic shipments increased far more in absolute terms than imports. * * *

* * * * *

U.S. exports

Capacitors.--The total value of U.S. exports of fixed capacitors increased from \$21.2 million in 1966 to \$29.5 million in 1969 before declining to \$26.6 million in 1970. Principal markets were developed countries such as Canada and the countries in the European Economic Community. The bulk of the value of exports consisted of capacitors for electronic applications and was principally electrolytic capacitors. U.S. exports to Mexico, the fourth largest market, were largely parts of capacitors which are believed to be assembled in Mexico for export, as completed capacitors, to the United States (appendix table 19, page Z-20).

Transistors and integrated circuits.--The total value of U.S. exports of transistors increased from \$46.4 million to \$88.9 million from 1967 to 1970 and of integrated circuits from \$26.5 million to \$99.8 million. The major markets were developed countries, principally Japan (appendix tables 20 and 21, pages Z-21 and Z-22).

Sprague Electric Company

Company organization and product line

Sprague Electric Company, incorporated in 1926, is a multiproduct, multinational corporation consisting of 19 manufacturing establishments and subsidiaries and an affiliated company in the United States and 13 manufacturing facilities and affiliated companies in foreign countries, principally in the European Economic Community, the Far East, and Mexico. The firm's headquarters are at North Adams, Mass. In its early years, Sprague produced capacitors, principally, but gradually expanded its production to other electronic components and networks such as pulse transformers, pulse-forming networks, electronic filters, resistors, inductors, and shift registers. In 1956, the firm commenced production of transistors and, in 1966, of integrated circuits. The bulk of Sprague's production consists of capacitors of virtually every type. Sprague is reported by Standard & Poor's to be the largest producer of capacitors in the United States.

* * * * *

Capacitors.--Capacitors are produced at ten of Sprague's domestic establishments, five of which are involved in petitions for adjustment assistance. * * *

* * * * *

Transistors.--Transistors are produced at two of Sprague's domestic establishments; however, each establishment produces a different type, the types produced are dissimilar in use, and production facilities used to produce the different types are considerably different. * * *

* * * * *

Integrated circuits.--Integrated circuits (IC's), produced by Sprague initially in 1966, are produced in one of the firm's domestic establishments and also by an affiliated firm in which Sprague owns a minority interest. The IC's cited in the firm petition are different from those produced by the affiliated firm and the processes used in production are quite different. * * *

* * * * *

Markets

The principal users of products produced by Sprague are original equipment manufacturers in electronic industries such as consumer electronic products, data processing, and electronic instruments. The following sections indicate trends in domestic shipments and imports of major articles produced.

Television receivers.--The quantity and value of shipments of U.S.-produced television receivers declined from 1966 to 1970 except in 1968 as shown below.

Television receivers and combinations: Shipments of U.S.-produced units, 1966-70

Item	: 1966	: 1967	: 1968	: 1969	: 1970
Quantity---million units--:	11.7	9.7	10.3	8.9	7.8
Value----million dollars--:	2,349.6	2,191.5	2,222.5	1,859.5	<u>1/</u> 1,700.0

1/ Estimated by the Tariff Commission staff.

The market is supplied by imported television receivers in increasing amounts as shown below.

Television receivers and combinations: U.S. imports for consumption, 1966-70

Item	1966	1967	1968	1969	1970
Quantity-----million units--	1.5	1.6	2.7	4.0	4.5
Value-----million dollars--	115.7	125.6	203.8	295.9	315.7

* * * * *
Electronic computing equipment.--The value of U.S. shipments of electronic computing equipment is estimated by the Bureau of Domestic Commerce to have declined in 1970 after a 3-year increase as shown below.

Electronic computing equipment: Value of shipments by U.S. producers, 1967-70

(In millions of dollars)

Item	1967	1968	1969	1970
Value of shipments-----	3,761	4,151	^{1/} 4,421	^{1/} 4,200

^{1/} Estimated by the Bureau of Domestic Commerce.

The share of the market supplied by imported electronic computing equipment is unknown. Available import data on certain computing

equipment and parts are shown below. Such data are not necessarily representative.

Specified computing equipment: Value of U.S. imports, 1966-70

(In millions of dollars)

Item	1966	1967	1968	1969	1970
Accounting, computing and other data processing machines-----	5.6	8.3	11.1	14.8	17.6
Calculating machines especially constructed for multiplying and dividing-----	36.3	49.9	74.0	108.1	158.1
Parts of machines incorp- orating a calculating mechanism-----	28.4	39.4	50.3	99.2	120.0

Laboratory and engineering instruments.--The value of U.S. shipments of laboratory and engineering instruments increased from \$1 billion in 1967 to an estimated \$1.25 billion in 1970.

Laboratory and engineering instruments: Value of shipments by U.S. producers, 1967-70

(In billions of dollars)

Item	1967	1968	1969	1970
Value of shipments-----	1.00	1.12	<u>1/</u> 1.15	<u>1/</u> 1.25

1/ Estimated by the Bureau of Domestic Commerce.

The share of the market supplied by imported laboratory and engineering instruments is believed to be small but increasing.

Available data on certain instruments are shown below. Such data are not necessarily representative.

Certain electrical measuring, checking, analyzing, or automatically controlling instruments and apparatus, and parts thereof: Value of U.S. imports for consumption, 1966-70

(In millions of dollars)

Item	1966	1967	1968	1969	1970
Value of U.S. imports -----	1/	1/	49.8	56.7	77.8

1/ Not available.

* * * * *

Prices

A comparison has been made of domestic and foreign prices of the products cited in the petition from purchase data submitted to the Commission * * *. The data include prices paid, and prices quoted, for delivered purchases from foreign suppliers, Sprague, and other domestic suppliers of like items, and the quantities involved. * * *

* * * * *

North Adams, Massachusetts Plant
(TEA-W-82)

Introduction

Local #200 of the International Union of Electrical, Radio and Machine Workers petitioned the Tariff Commission for adjustment assistance on behalf of a group of workers at the Marshall Street, North Adams, Massachusetts plant of the Sprague Electric Corp., citing increased imports of small-can twist-prong aluminum electrolytic capacitors as the cause of unemployment at the plant.

Plant History

Sprague's Marshall Street plant in North Adams, Massachusetts, is one of four factories and a modern research and development center situated in that community. The plant (formerly used for textile printing) was acquired by Sprague in 1944 at which time it was extensively renovated. The plant encompasses an area * * * utilized for office activities, laboratories, warehouses, machine shops and various manufacturing operations, * * *.

Production at the Marshall Street plant during the period 1966-70, included * * *. The specific capacitor involved in this worker petition, however, is the small-can twist prong aluminum electrolytic type (hereinafter referred to as small-can capacitors).

* * *

* * * * *

Worcester, Massachusetts Plant
(TEA-W-83)

Introduction

A group of workers at the Worcester, Mass., establishment petitioned for adjustment assistance owing to unemployment caused by U.S. imports of silicon monolithic integrated circuits.

Plant history

Sprague Electric Company constructed the Worcester, Mass., plant in 1966 for the production of integrated circuits. The plant is reported by a firm spokesman to be one of the most modern facilities in the industry. * * * In addition to silicon monolithic integrated circuits, thin film hybrid circuits and parts of integrated circuits, such as chips and wafers, are produced in the plant.

* * * * *

Imports

* * * * *

The total value of U.S. imports of integrated circuits in 1970 was \$69 million as reported in official Government statistics. Prior to 1970, imports are estimated to have increased from about \$4 million in 1967 to \$30 million in 1969. * * *

The principal sources of U.S. imports of semiconductors (including transistors and integrated circuits) are foreign manufacturing subsidiaries of U.S. firms. The foreign facilities are located in less-developed countries such as Mexico, Taiwan, Singapore, and Hong Kong (appendix tables 17 and 18, page Z-18). Virtually all of the imports from the facilities in those countries are entered into the United States under TSUS item 806.30 or 807.00. The increased use of TSUS items 806.30 and 807.00 by U.S. producers is shown below.

Semiconductors (including transistors and integrated circuits and parts): U.S. imports for consumption and imports under TSUS items 806.30 and 807.00, 1966-70.

(In millions of dollars)

Item	1966	1967	1968	1969	1970
Total U.S. imports (including those under items 806.30 and 807.00)-----	49.8	50.2	89.2	154.7	189.3
Imports under TSUS item 807.00-----	31.3	36.3	67.2	106.2	125.1
Imports under TSUS item 806.30-----	-	-	2.8	20.3	32.7
Imports, wholly foreign-produced----	18.5	13.9	19.2	28.2	31.5

Semiconductors imported under item 806.30 were all integrated circuits in 1968-69 and are believed to have been mostly integrated circuits in 1970. The bulk of the imports of semiconductors under item 807.00 consisted of transistors during 1966-70. Other imports under item 807.00 are principally diodes and parts of semiconductors.

* * * * *

Hillsville, Virginia Plant
(TEA-W-84)

Introduction

A group of workers at the Hillsville, Virginia plant of Sprague Electric Corp. petitioned the Tariff Commission for adjustment assistance, citing increased imports of metal case tubular aluminum electrolytic capacitors as the cause of unemployment at the plant.

Plant history

Sprague's plant at Hillsville, Virginia is a one-story building * * *. The building, originally a ladies stocking plant, was purchased by Sprague in 1961; it was expanded to its present size in 1963.

The Hillsville plant originally produced AC oil capacitors; in 1967, it began to concentrate on production of metal case tubular aluminum electrolytic capacitors, the product named in the petition. * * * Aluminum electrolytic capacitors have high values of capacitance; the tantalum types may be used in lieu of the aluminum types at lower voltages, but they are more expensive and are used mainly for military purposes because of a reputation for dependability.

* * * * *

U.S. imports

* * * * *

Imports of all fixed capacitors under the provisions of TSUS items 806.30 and 807.00, which permits a duty allowance under certain conditions, ranged from about 1 percent of total imports of such articles in 1966 to 28 percent in 1970 (appendix table 11, page Z-12).

* * * * *

Lansing, North Carolina Plant
(TEA-W-85)

Introduction

A group of workers at the Lansing, N.C., plant of the Sprague Electric Corp. petitioned the Tariff Commission for adjustment assistance, citing increased imports of metal case tubular and small can twist-prong aluminum electrolytic capacitors as the cause of unemployment at the plant.

Plant history

The Lansing establishment consists of one building erected in 1953 and enlarged four times through 1966 when it reached its current size * * *.

* * * * *

U.S. imports

* * * * *

Imports of all fixed capacitors, under the provisions of TSUS items 806.30 and 807.00, which permit a duty allowance under certain conditions, were principally from Mexico and Taiwan. Imports under these two provisions ranged from 1 percent of total imports, by value, in 1966 to 28 percent in 1970.

* * * * *

Concord, New Hampshire Plant
(TEA-W-86)

Introduction

A group of workers at the Concord, New Hampshire, plant of the Sprague Electric Co. petitioned the Tariff Commission for adjustment assistance, citing increased imports of transistors as the cause of unemployment at the plant.

Plant history

The first wing of the Concord, N.H., plant was originally built in 1956 with additions constructed in 1956, 1960, 1961, 1963, and 1966.

* * *

* * * * *

* * *, transistors were introduced into manufacturing at Concord, N.H., and present production includes germanium and silicon hermetic-sealed units and epoxy type silicon units. * * *

* * * * *

Signal transistors are produced by the Sprague Electric Co. at its Concord, N.H., plant only. Power transistors are produced through the firm's manufacturing facilities at Pirgo Electronics, Inc., Farmingdale, N.Y.

* * * * *

U.S. imports

U.S. imports of transistors in 1966-70 increased 130 percent in quantity and 109 percent in value, rising from 262 million units valued at \$29 million in 1966 to 602 million units valued at \$60 million in 1970 (appendix table 17, page Z-18). During this period, the quantity of imports was greatest in 1969 when it amounted to 701 million units valued at \$59 million. * * *

Transistors compete with integrated circuits and other semiconductors, imports of which increased in value from \$22 million in 1966 to \$130 million in 1970 (appendix table 18, page Z-19).

* * * * *

Barre, Vermont Plant
(TEA-W-87)

Introduction

A group of workers at the Barre, Vermont, Plant of the Sprague Electric Corporation petitioned the Tariff Commission for adjustment assistance, citing increased imports of nonmetal case paper dielectric, film dielectric, dual dielectric, and metallized dielectric capacitors (all of which are categorized as paper or film capacitors) as the cause of unemployment at the plant.

Plant history

The Barre Plant of Sprague Electric Company is located in Barre, Vermont. Most buildings of the plant were erected during 1910-20 to house granite for tombstones. Additional wings and adjunct building were added through 1962. * * * The building area has been significantly renovated over the years to permit the maximum efficiency in production at a certain quality level. The building area was leased by Sprague from Rock of Ages Corporation beginning in 1945; in 1969, however, it was purchased by Sprague.

Since 1966, the Barre Plant has made fixed capacitors of four types (all with a nonmetal casing): paper dielectric, film dielectric, dual dielectric, and metallized dielectric. The Barre Plant has made no other products since 1965; it has also been the only plant of Sprague in recent years that has manufactured nonmetal case paper or film fixed capacitors.

Competitive capacitors

The four types of capacitors made by the Barre Plant can be generally used interchangeably; it follows, therefore, that they are directly competitive with each other. Production of each of the four types may vary considerably according to demand; * * *

* * * * *

Grafton, Wisconsin Plant
(TEA-W-88)

Introduction

A group of workers at the Sprague of Wisconsin, Inc. plant at Grafton, Wis. petitioned the Tariff Commission for adjustment assistance, citing increased imports of ceramic disc capacitors as the cause of unemployment at the plant.

Plant history

Sprague of Wisconsin, Inc., located in Grafton, Wis., a small community about 15 miles from Milwaukee, was a wholly owned subsidiary of Sprague Electric Company until April 1971, at which time it was merged into the parent company. The plant is a one-story building * * *. It was constructed for the company in 1953 specifically for the manufacture of ceramic capacitors, principally disc type. * * *

* * * * *

STATISTICAL APPENDIX

Table 1.--Fixed capacitors: Total U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1966-70

Year	U.S. producers' shipments <u>1/</u>	Imports <u>2/</u>	Exports	Apparent consumption	Ratio (percent) of imports to consumption
Quantity (million units)					
1966-----	***	***	111	***	***
1967-----	***	***	92	***	***
1968-----	***	***	99	***	***
1969-----	***	***	134	***	***
1970-----	***	***	97	***	***
Value (1,000 dollars)					
1966-----	***	***	21,171	***	***
1967-----	***	***	20,289	***	***
1968-----	***	***	22,263	***	***
1969-----	***	***	29,494	***	***
1970-----	***	***	26,551	***	***
<u>1/</u> * * *					
<u>2/</u> * * *					

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 3 .--Capacitors, fixed electrolytic: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1966-70

Year	Domestic shipments <u>1/</u>	Im-ports <u>2/</u>	Exports	Apparent consumption	Ratio (percent) of imports to consumption
Quantity (million units)					
1966-----	***	***	21	***	***
1967-----	***	***	7	***	***
1968-----	***	***	13	***	***
1969-----	***	***	25	***	***
1970-----	***	***	37	***	***
Value (1,000 dollars)					
1966-----	***	***	8,913	***	***
1967-----	***	***	7,055	***	***
1968-----	***	***	8,498	***	***
1969-----	***	***	12,872	***	***
1970-----	***	***	16,934	***	***
<u>1/</u>	***				
<u>2/</u>	***				

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 4.--Capacitors, fixed, paper or film dielectric: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1966-70

Year	Domestic shipments <u>1/</u>	Imports <u>2/</u>	Exports	Apparent consumption	Ratio (percent) of imports to consumption
Quantity (million units)					
1966-----	***	***	8	***	***
1967-----	***	***	11	***	***
1968-----	***	***	7	***	***
1969-----	***	***	11	***	***
1970-----	***	***	11	***	***
Value (1,000 dollars)					
1966-----	***	***	2,168	***	***
1967-----	***	***	2,538	***	***
1968-----	***	***	2,156	***	***
1969-----	***	***	2,895	***	***
1970-----	***	***	3,022	***	***
<u>1/</u>	***.				
<u>2/</u>	***.				

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 5.--Capacitors, fixed ceramic: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1966-70

Year	Domestic shipments <u>1/</u>	Im-ports <u>2/</u>	Exports	Apparent consumption	Ratio :(percent) of imports to consumption
Quantity (million units)					
1966-----	***	***	<u>3/</u> 18	***	***
1967-----	***	***	<u>3/</u> 13	***	***
1968-----	***	***	<u>3/</u> 17	***	***
1969-----	***	***	<u>3/</u> 17	***	***
1970-----	***	***	14	***	***
Value (1,000 dollars)					
1966-----	***	***	<u>3/</u> 1,817	***	***
1967-----	***	***	<u>3/</u> 1,626	***	***
1968-----	***	***	<u>3/</u> 1,820	***	***
1969-----	***	***	<u>3/</u> 2,008	***	***
1970-----	***	***	1,892	***	***

1/ * * *

2/ * * *

3/ Estimated by the staff of the U.S. Tariff Commission.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 6.--Capacitors, fixed, other than electrolytic, paper and film:
U.S. producers' shipments, imports for consumption, exports of
domestic merchandise, and apparent consumption, 1966-70

Year	U.S. producers' shipments ^{1/}	Im-ports ^{2/}	Exports	Apparent consumption	Ratio (percent) of imports to consumption
Quantity (million units)					
1966-----	***	***	<u>3/</u> 56	***	***
1967-----	***	***	<u>3/</u> 39	***	***
1968-----	***	***	<u>3/</u> 44	***	***
1969-----	***	***	<u>3/</u> 40	***	***
1970-----	***	***	<u>3/</u> 35	***	***
Value (1,000 dollars)					
1966-----	***	***	<u>3/</u> 7,226	***	***
1967-----	***	***	<u>3/</u> 5,729	***	***
1968-----	***	***	<u>3/</u> 5,522	***	***
1969-----	***	***	<u>3/</u> 5,688	***	***
1970-----	***	***	<u>3/</u> 4,703	***	***

^{1/} * * *

^{2/} * * *

^{3/} Estimated by the staff of the U.S. Tariff Commission.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 7.--Transistors: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1966-70

Year	U.S. producers' shipments ^{1/}	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
Quantity (1,000 units)					
1966-----	***	261,945	72,248	***	***
1967-----	***	296,657	85,410	***	***
1968-----	***	451,375	123,359	***	***
1969-----	***	701,360	280,222	***	***
1970-----	***	602,343	249,529	***	***
Value (1,000 dollars)					
1966-----	***	28,657	54,053	***	***
1967-----	***	26,890	46,434	***	***
1968-----	***	44,889	51,052	***	***
1969-----	***	59,001	83,092	***	***
1970-----	***	59,819	88,898	***	***

^{1/} * * *

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 9.--Integrated circuits: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1966-70

Year	U.S. producers' shipments <u>1/</u>	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
Quantity (1,000 units)					
1966-----	***	N.A.	N.A.	***	***
1967-----	***	N.A.	10,251	***	***
1968-----	***	N.A.	20,974	***	***
1969-----	***	N.A.	54,811	***	***
1970-----	***	248,710	66,003	***	***
Value (1,000 dollars)					
1966-----	***	N.A.	N.A.	***	***
1967-----	***	<u>2/</u> 4,000	26,468	***	***
1968-----	***	<u>2/</u> 13,000	36,152	***	***
1969-----	***	<u>2/</u> 30,000	72,425	***	***
1970-----	***	69,444	99,768	***	***

1/ * * *

2/ Data obtained from a trade article, Microelectronics Shakedown and Shakeout, prepared by Quantum Science Corp.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 11.--Electrical capacitors (all types): Percent of total value of U.S. imports supplied by principal sources and percent supplied by TSUS item 806.30 and 807.00 imports, 1965-70

Source	1965	1966	1967	1968	1969	1970
Percent supplied by principal sources						
Japan-----	66.2	68.8	66.2	54.6	46.3	39.4
Mexico-----	.2	.9	1.4	4.9	7.7	15.1
Taiwan-----	.4	.6	3.7	6.1	8.2	9.5
West Germany-----	8.3	7.5	7.7	11.2	11.0	9.0
Canada-----	.4	1.1	2.2	1.5	2.2	5.1
Netherlands-----	8.1	6.8	5.8	5.7	4.7	4.9
Italy-----	6.5	4.7	3.5	2.9	3.9	4.4
Jamaica-----	-	-	-	1.9	2.9	2.9
Portugal-----	-	-	-	1.7	3.2	2.6
Hong Kong-----	2.1	2.1	1.8	1.5	2.8	2.0
All other ^{1/} -----	7.8	7.5	7.7	8.0	7.1	5.1
Percent supplied by item 806.30 and 807.00 imports						
Japan-----	^{2/}	0.01	0.03	0.04	0.05	0.02
Mexico-----	^{2/}	.44	.80	4.18	7.21	13.61
Taiwan-----	^{2/}	.64	2.69	4.93	6.64	6.66
Canada-----	^{2/}	.24	.03	.02	.10	.74
Italy-----	^{2/}	-	-	-	-	.04
Jamaica-----	^{2/}	-	-	1.90	2.78	2.93
Portugal-----	^{2/}	-	-	1.33	3.18	2.62
Hong Kong-----	^{2/}	-	-	.18	.42	.84
All other-----	^{2/}	-	-	-	.10	.14
Total-----	^{2/}	1.33	3.60	10.87	20.48	27.60

^{1/} Adjusted to add to 100 percent.

^{2/} Data on item 807.00 imports in 1965 are incomplete.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 16.--Semiconductors (including transistors and integrated circuits) and parts thereof: Percent of total value of U.S. imports entered under items 806.30 and 807.00 and percent of total value of imports entered duty exempt

Source	(Percent)				
	1966	1967	1968	1969	1970
Imports under item 807.00:					
Total-----	63	72	75	69	66
Duty-free-----	23	40	43	40	39
Imports under item 806.30:					
Total-----	-	-	3	13	17
Duty-free-----	-	-	2	4	8

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 17.--Transistors: U.S. imports for consumption,
by principal sources, 1966-70

Source	1966	1967	1968	1969	1970
	Quantity (1,000 units)				
Mexico-----	991	9,450	80,918	135,699	80,085
Hong Kong-----	154,045	161,122	200,555	277,270	255,160
Ireland-----	59,455	83,127	85,725	124,426	98,973
Singapore-----	-	-	-	33,153	52,179
Japan-----	22,754	13,574	25,052	26,832	17,161
Portugal-----	-	613	1,176	22,421	22,860
Taiwan-----	2,246	9,022	21,346	41,645	20,776
Korean Republic-----	7	2,616	3,539	9,752	31,705
All other-----	22,446	17,133	33,064	30,162	23,444
Total-----	261,944	296,657	451,375	701,360	602,343
	Value (1,000 dollars)				
Mexico-----	295	1,653	11,874	11,753	18,384
Hong Kong-----	11,563	11,394	13,930	19,422	17,257
Ireland-----	7,897	7,640	7,543	9,345	7,298
Singapore-----	-	-	-	4,790	5,334
Japan-----	3,358	2,411	3,824	4,295	3,283
Portugal-----	-	89	184	2,009	2,218
Taiwan-----	169	682	1,791	2,217	1,490
Korean Republic-----	2	256	349	565	1,421
All other-----	5,372	2,624	5,226	4,605	3,134
Total-----	28,656	26,749	44,721	59,001	59,819

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 18.--Semiconductors (including integrated circuits) other than transistors and parts thereof: U.S. imports for consumption, by principal sources, 1966-70

(In thousands of dollars)

Source	1966	1967	1968	1969	1970
Korean Republic-----	18	597	8,366	18,892	22,188
Singapore-----	-	-	-	7,533	21,292
Hong Kong-----	7,503	6,899	6,663	12,565	19,017
Mexico-----	3	1,164	3,657	12,290	15,798
Japan-----	5,111	4,683	4,659	7,937	10,496
Taiwan-----	214	2,240	5,563	7,878	9,401
Netherlands Antilles----	-	-	849	11,185	5,993
Ireland-----	-	451	3,537	3,297	5,623
All other-----	8,693	7,938	12,450	15,263	19,771
Total-----	21,542	23,972	45,744	96,840	129,579

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 19.--Electrical capacitors, all types: U.S. exports of domestic merchandise, by principal markets, 1966-70

(In thousands of dollars)

Market	1966	1967	1968	1969	1970
France-----	4,697	3,852	3,545	4,673	6,646
Canada-----	7,526	6,882	7,213	6,946	6,246
West Germany---	1,812	1,808	2,541	4,087	5,513
Mexico-----	519	796	1,982	3,077	4,643
United Kingdom---	3,147	2,897	2,513	3,206	3,429
All other-----	9,093	9,556	11,231	16,291	21,375
Total-----	26,794	25,791	29,025	38,280	47,852

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 20.--Transistors: U.S. exports of domestic merchandise,
by principal markets, 1966-70

Source	1966	1967	1968	1969	1970
	Quantity (million units)				
Japan-----	5.4	10.2	14.4	35.7	53.1
West Germany-----	2.8	3.9	8.7	23.9	41.6
Switzerland-----	12.7	9.6	9.1	27.8	33.2
United Kingdom-----	8.9	5.7	7.7	13.7	20.6
France-----	6.2	10.8	25.3	37.5	23.7
Canada-----	6.9	8.5	14.2	18.4	18.4
Hong Kong-----	16.3	19.9	20.3	63.2	24.4
All other-----	13.3	16.8	23.7	60.0	34.5
Total-----	72.5	85.4	123.4	280.2	249.5
	Value (1,000 dollars)				
Japan-----	3.6	4.8	5.4	10.0	16.3
West Germany-----	3.0	3.6	5.3	10.0	14.4
Switzerland-----	11.0	9.3	7.4	11.7	13.2
United Kingdom-----	8.2	5.0	6.4	8.3	10.2
France-----	7.3	6.5	7.2	11.2	9.6
Canada-----	6.3	5.5	5.9	6.4	5.9
Hong Kong-----	3.9	1.9	2.5	4.4	2.4
All other-----	10.8	9.8	11.0	21.1	16.9
Total-----	54.1	46.4	51.1	83.1	88.9

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 21.--Integrated circuits: U.S. exports of domestic merchandise, by principal markets, 1967-70

Source	1967	1968	1969	1970
	Quantity (million units)			
Japan-----	2.8	8.6	14.2	17.7
West Germany-----	.7	1.3	6.1	19.1
Switzerland-----	1.8	2.9	6.4	6.3
United Kingdom-----	1.4	1.8	4.9	4.1
Netherlands-----	.4	.8	2.7	5.4
France-----	.7	1.5	3.6	2.3
All other-----	2.5	4.1	16.9	11.1
Total-----	10.3	21.0	54.8	66.0
	Value (1,000 dollars)			
Japan-----	5.2	10.5	19.5	47.8
West Germany-----	2.1	2.9	8.3	15.1
Switzerland-----	4.9	4.7	8.0	9.6
United Kingdom-----	4.1	4.3	8.6	6.9
Netherlands-----	1.2	2.4	4.2	5.7
France-----	3.1	3.3	6.4	4.8
All other-----	5.9	8.1	17.4	9.9
Total-----	26.5	36.2	72.4	99.8

Source: Compiled from official statistics of the U.S. Department of Commerce.

