TeledyneReport

third quarter 1977

Dental Health: Better Care for More People

BELOW: The modern dental operatory is designed for convenience, efficiency and comfort, for both the dentist and his patients. Shown at the right and left of the chair are two Teledyne mobile dental units and various Teledyne instruments.

ON THE COVER: An apple, with a good bite out of it, symbolizes the topic of this report: Good dental health.

Dental Health

Teledyne produces many of the instruments, materials and supplies that have helped revolutionize dental care in the United States.

Somewhere out there, hidden in the big cities and the small towns, scattered throughout schools and factories and homes and offices and farms, from the quiet reaches of Utah's canyon country to the board rooms of New York City, there are nearly a billion teeth that need repair and filling, according to an estimate of the American Dental Association. That veritable Grand Canyon of mouldering molars is a startling statistic for a nation that prides itself on the world's highest standard of living, and on its modern health care.

In spite of this estimate, however, dental health care in the United States is better than it has ever been in the past, and is improving steadily year by year. The problem has not been one of unavailability of good dental care, but rather one of reluctance or inability of some patients to obtain it. The greatest barriers to better dental health have historically been psychological and economic.

Dental health has always been an important factor in the general health and quality of life of a person, but dental conditions are rarely life-threatening in the short term. Consequently, many persons have found it easier to postpone or avoid dental treatment than to face their fear of pain or discomfort. Similarly, since dental treatment can be postponed, it is often delayed until some hoped-for time when the expense will fit more easily into the family budget.

These historic barriers have begun to fall in the last two decades, however, and today more persons are receiving better and more regular dental care in the United States than ever before. In 1974, for example, almost 50 percent of the U.S. population visited a dentist, compared to only 42 percent in 1964. That comparatively small percentage increase represented some 15 million additional persons who received dental care in 1974 alone. Over the same ten year period, the annual number of visits per patient also went up from an average of 1.3 to 1.7, reflecting a greater amount of care for each patient.

Today, dentists no longer have to promote the painlessness of their procedures as they did in the earliest days of dentistry, because modern techniques have achieved those goals almost universally. Some procedures involve little if any more discomfort than a visit to a barber. Other procedures that are potentially painful are made painless with modern, quick-acting local anesthetics.

Discomfort is also reduced by high-speed, air-driven water-cooled turbine handpieces, fast-cutting diamond or carbide-tipped drilling burs, quick-setting impression compounds, cements and other instruments and materials that speed the com-

pletion of modern dental procedures and benefit both the patient and the dentist.

Early experience is playing a part, too. Children today who become used to non-frightening visits to a dentist at an early age for check-ups and hygiene instruction, grow up accustomed to having routine dental care as an expected part of their lives.

TELEDYNE AND THE DENTAL MARKET

In the pursuit of better dental care, the U.S. dental profession spends more than half a billion dollars each year on the materials, instruments and equipment that help make modern dentistry possible. Most of this expenditure is for the supplies needed to run established dental offices, laboratories, clinics and schools, but each year several thousand newly graduated dentists also enter private practice and spend upwards of $30,000 each for their minimum basic equipment and supplies.

Teledyne is an important supplier of products for this professional dental market. Products sold under such well-known and long-established brand names as Ames, Blu-White, Densco, D-P, Emesco, Getz, Hanau, Opotow and Lee Smith are all produced by Teledyne Dental. Most of these names go back into the early years of this century, and two, Ames and Densco, were established in the 1890's. The instruments and materials sold under these names have changed greatly over the years, with improvements and innovations that have helped make modern dental procedures possible.

DENTAL HANDPIECES

Perhaps the single tool that is most often associated with dentistry is what the layman calls the dentist's drill. In the profession this tool is referred to as a dental handpiece, and the tiny tips that actually do the cutting are known as dental burs rather than drills. These instruments are used to remove decay from the tooth structure and to shape and prepare it to accept and hold various types of filling materials or other dental restorations such as crowns, bridges or inlays. Advances in the design and performance of dental handpieces and burs have been one of the major contributions to modern dentistry.

The earliest tools for removing tooth structure were simple steel shafts with cutting burs formed on one end. The tool was laboriously twirled between the dentist's fingers to slowly cut into the tooth. Then came geared, hand-operated tools that were cranked by the dentist, footpowered devices driven by a treadle, and finally handpieces that were belt-driven by electric motors.

In all this development the trend was toward higher rotational speed of the cutting bur and harder cutting materials for the burs themselves. Belt-driven handpieces ultimately reached speeds of up to about 50,000 revolutions per minute (RPM) and are still used by dental hygienists for cleaning teeth, and by dental laboratories in fashioning dental reconstructions that are attached to the teeth.

Still higher speeds were needed by the dentist for cutting tooth structure and this was ultimately achieved with the introduction of air-turbine operated handpieces. Modern handpieces of this type, such as Teledyne's Blu-White high speed handpiece, can achieve free-running speeds of more than 400,000 RPM, and speeds from 100,000 to 200,000 RPM when under cutting load.

These incredible speeds are achieved by driving the cutting bur directly from the shaft of a tiny turbine, less than a quarter inch in diameter, which is spun by a jet of compressed air. At these speeds the centrifugal forces are so great that each of the tiny ball bearings on which the turbine rotates has an effective weight of more than one-half pound even though they are less than 1/25 inch in diameter and weigh less than .00001 pound at rest.

Optimum speeds for efficiently cutting tooth structure have been found to be about 125,000 RPM. At these speeds the burs cut easily through the tooth with little of the pressure that was required at slower speeds. This permits the dentist to operate with much greater control and to remove the minimum amount of material consistent

with good restorative practice. It also results in much greater comfort for the patient by eliminating the vibration or grinding sensation that was so objectionable in the past.

Considerable heat is generated by cutting friction at these speeds and consequently the rotating bur and the tooth are cooled by water and air jets introduced through the tip of the handpiece itself.

DENTAL BURS

Cutting burs underwent similar development to keep up with the higher speeds. Even the best steels wore out very quickly when confronted with the tooth enamel which is some three times harder than bone. A logical development was the introduction of one of the hardest man-made materials, tungsten carbide, for cutting burs, and also ultimately the hardest material of all: diamond.

Teledyne produces a line of diamond burs under the trade name Blu-White. These are made by bonding diamond particles to the surface of various shaped steel mandrels, through a complex series of steps. The finest type of natural industrial diamonds are crushed and graded into various particle sizes. These particles are held onto the surface of the mandrel by an electrolytic amalgamation plating process. The diamonds are encased and bonded by the metal material which surrounds them. The hardness of the metal deposited is increased as the process continues, until a final layer of hard chromium is applied which is almost as hard as the diamonds themselves. Just the sharp tips of the diamond particles protrude through this metal matrix which holds them firmly in place.

Because of the high speeds at which these products are used, great attention is paid to the concentricity and balance of both the steel mandrels used, and the completed burs. Teledyne Blu-White diamond burs designed for high-speed use are made on mandrels machined from a single piece of metal to provide this strength and precision, in contrast to those diamond burs made by brazing a separate head piece to the shank.

Diamond dental burs are made in an almost infinite variety of shapes and sizes, ranging from slender needle-like shapes used for crown preparations to a variety of balls, cylinders, cones, flames, discs and saws each ideally suited for some specific dental cutting purpose. These many shapes and sizes are also available in various diamond particle sizes, from very coarse for roughing out work to extremely fine for finishing and polishing work.

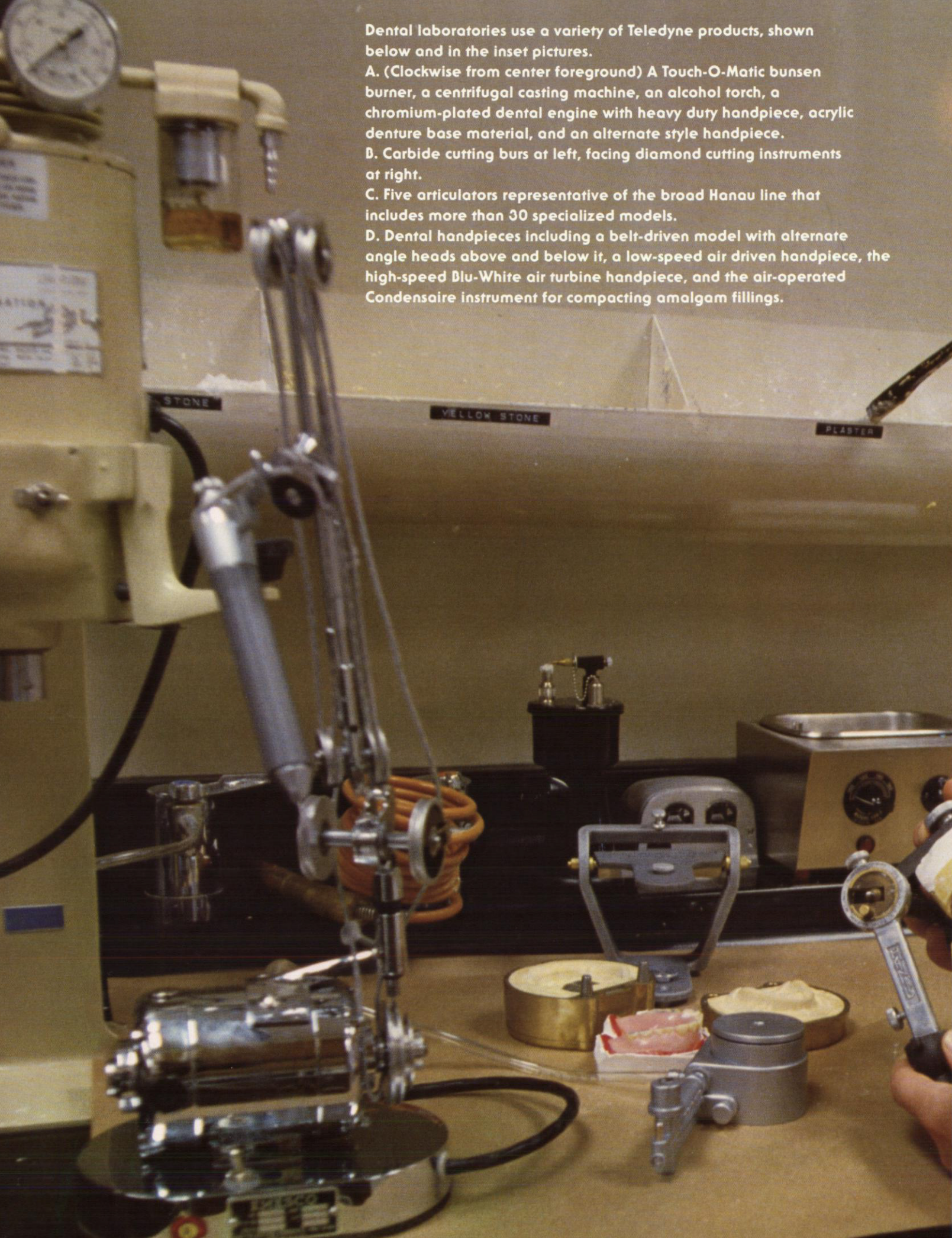
The fast-cutting, long-wearing characteristics of diamond burs have made possible many smaller cutters which were impractical with other materials, and this in turn has made possible more delicate procedures with less intrusion into the healthy tooth material.

Modern dental handpieces and cutting burs have revolutionized one aspect of dentistry. Preparing a tooth for filling with these modern tools may take only a minute or two, compared to ten or fifteen minutes or longer with older, less efficient equipment. The result is less discomfort for the patient and less tedious work for the dentist, with the added bonus of allowing the dentist to care for more patients in a given time.

RESTORATIVE DENTISTRY

The emphasis in dentistry today is on prevention of dental disease and the restoration of all teeth that can be saved. Fluoride treatments, better periodontic care to avoid the loss of teeth through gum disease, and better hygiene all contribute to the prevention of dental problems.

Improved products for home dental care, such as Teledyne's Water Pik Oral Hygiene Appliance, have also helped promote better dental health. The Water Pik Appliance employs a tiny jet of water, pulsating up to 1200 times a minute at pressures up to 85 pounds per square inch, to efficiently clean food particles and debris from between the teeth and under the edges of the gums. The appliance is also available with a



Dental laboratories use a variety of Teledyne products, shown below and in the inset pictures.

A. (Clockwise from center foreground) A Touch-O-Matic bunsen burner, a centrifugal casting machine, an alcohol torch, a chromium-plated dental engine with heavy duty handpiece, acrylic denture base material, and an alternate style handpiece.

B. Carbide cutting burs at left, facing diamond cutting instruments at right.

C. Five articulators representative of the broad Hanau line that includes more than 30 specialized models.

D. Dental handpieces including a belt-driven model with alternate angle heads above and below it, a low-speed air driven handpiece, the high-speed Blu-White air turbine handpiece, and the air-operated Condensaire instrument for compacting amalgam fillings.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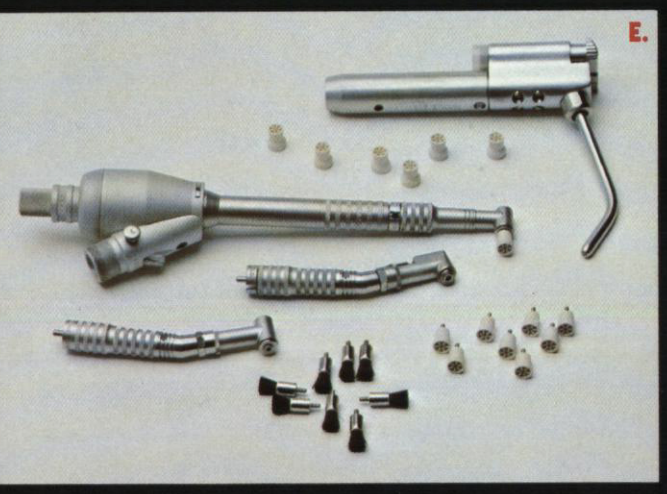

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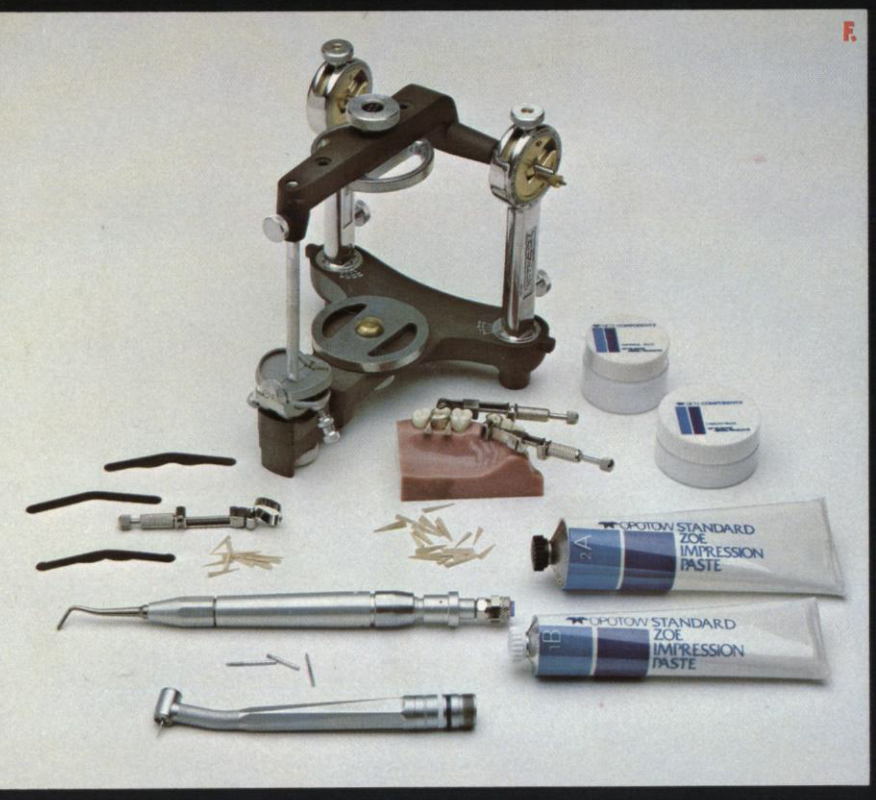

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Instruments and materials frequently used in the dental operatory are shown inset against a background of a university dental school teaching clinic.

E. Instruments frequently used by dental hygienists (from the top), an air-water syringe, rubber dental cups for polishing teeth, a low-speed air-operated handpiece, two alternate contra-angle heads for the handpiece, and more polishing cups and brushes.

F. (Clockwise from center bottom) Blu-White high-speed air turbine handpiece, cutting burs, Condensaire amalgam condenser, Tofflemire matrix bands and retainer with wooden wedges (also shown mounted on a model in center), a Hanau articulator, composite filling material and one type of impression compound.

G. A variety of dental cements.

H. A variety of special-purpose impression materials, with disposable plastic trays for taking dental impressions, shown in the foreground.

cordless electric toothbrush to provide a complete family oral hygiene center.

With more widespread preventative care—both professional and in the home—fewer and fewer extractions are now necessary, and are usually made only as a last resort. This leaves many more teeth that require some degree of restoration. Filling the tooth with silver amalgam or newer composite materials that match the color of the tooth is still the most common form of restoration. However, since many more teeth are being saved that might have required extraction in earlier years, a great deal of more complex and sophisticated restorative dentistry is carried out today. This involves the preparation of crowns, inlays, bridges, partial dentures and similar prostheses to solve problems beyond the help of simple fillings. Even more advanced techniques of inserting stainless steel or vitreous carbon implants into jawbones as anchors for dental restorations are being actively explored.

THE ARTICULATOR

The whole field of complex restorative dentistry has been made practical by a somewhat arcane piece of dental equipment known as an articulator. This is a precision instrument designed to duplicate the articulation or action of a specific person's jaw, a feat that is more complex than it might seem at first glance.

The human jaw is more than a simple hinge. In addition to opening and closing like a hinge it can move from side to side, jut forward, pull back and tilt. The problem of duplicating these actions is compounded by the fact that the dimensions of each person's jaw structure and its scope of movement is unique to that individual.

An articulator is needed whenever a prosthesis is made for the mouth, whether it is a simple crown, a bridge or a partial or full denture, in order to duplicate those motions, and to assure that the finished restoration will function properly in the patient's mouth. This method is called the indirect technique, because the restoration is made on a plaster cast made from an impression taken from the patient's teeth and mouth, and usually requires only slight final adjusting when it is secured in the mouth.

The indirect method of making modern dental restorations has been made possible by the development of the adjustable articulator, and saves both the dentist and the patient considerable time, difficulty and discomfort.

THE HANAU ARTICULATOR

The most widely used line of adjustable articulators in the United States is the Hanau line, produced by Teledyne. This line of articulators was first introduced in 1922 by R.L. Hanau, a mechanical engineer who became interested in the problems involved in designing a suitable mechanism to fulfill the needs of dentists at that time. He worked in close collaboration with prominent dental scientists and made a substantial contribution to dentistry through the design of his mechanisms as well as his formulation of the Laws of Articulation which clarified the entire problem and are still used today.

The Hanau articulator line today embodies the most complete series available, ranging from simple versions for student use, up to complex models used in dental research. They are used in dental schools, clinics, laboratories and in private dental practice throughout the world.

THE MATERIALS OF DENTISTRY

Dentistry involves a tremendous variety of specialized materials, each of which must fulfill some precise function with great accuracy and reliability, often under difficult or hostile conditions. The average American man, for example, can exert a pressure of 200 to 300 pounds per square inch with his teeth. Women average slightly less, but Eskimos, who apparently do a lot more hard chewing, can exert up to 350 pounds pressure with their teeth. This means that materials used in dental restorations must be able to withstand such loads over a long period of time. The materials must also be immune to the effect of constant moisture, mouth enzymes, and food acids. They must also be non-toxic and not impart any taste of their own. Teledyne produces many

dental materials under various trade names already mentioned.

Among filling materials, the classic silver amalgam, which goes back to before the turn of the century, is still an ideal material and is widely used. More modern materials have also been developed, however, primarily for cosmetic reasons. Composites such as Teledyne's Compodent II, for example, made of crushed quartz and a chemical binder, can be made to match the color of teeth closely, and performs well.

Acrylics, also produced by Teledyne under various brand names for use as a denture base material, have revolutionized the making of partial and full dentures. These materials are light, strong, inert and tasteless and can be made to match the color and appearance of natural gums quite closely.

Many materials used by dentists do not remain in the patient's mouth. They are used in the intermediate steps of preparing restorations. Among these are several types of impression compounds used by the dentist to make an exact mold or impression of the tooth and gum structure of the patient. The impression is then used to prepare a replica of the patient's teeth and gums by making a cast of plaster, dental stone or other material. This cast then becomes the temporary base on which the restorations are constructed, usually with the help of an articulator.

Teledyne makes several types of impression compounds, including alginate types made from agar derived from seaweed, rubber based and silicone based elastomer types, the widely-used zinc oxide eugenol types and a variety of other specialized kinds.

Cements form another diverse and widely-used category of dental materials. Most are designed for specialized purposes. Temporary cements, for example, may be used to fasten a temporary crown to a patient's tooth while the permanent crown is being made. It is easily removed when necessary.

Permanent cements, on the other hand, must be able to adhere the final restoration in place and withstand the pressures of chewing and the solvent action of food and saliva, over a long period of time. A permanent crown may fit over the prepared tooth with a clearance of as little as 1/10,000 inch and so these cements must have a low film thickness to fill any spaces completely.

Still other cements are used by orthodontists to adhere orthodontic appliances to the teeth. Teledyne manufactures a complete line of cements for most dental purposes.

TOOLS FOR THE PROFESSION

In addition to the major products already described, Teledyne markets many other products that are used by the dentist and the dental technician in the preparation of modern dental restorations. These range from matrix bands and retainers, used to surround a tooth and hold filling material in place until it hardens, to centrifugal casting machines that are used to cast gold inlays or crowns by the lost-wax method. The Hanau alcohol torch and the Touch-O-Matic bunsen burner used in making wax preparations are virtually standards of the profession.

Emesco brand dental engines, handpieces and cutting burs are designed specifically for use in the dental laboratory in preparing restorations ranging from crowns to full dentures. They are an important part of the Teledyne line, as are flasks and presses for curing denture materials under heat and pressure, dental lathes, electroplating equipment, and water baths for conditioning or curing various materials.

The materials and instruments used in professional dentistry have been improved dramatically in the last few decades, and will continue to evolve as new materials and methods are discovered. The goal has been to speed dental procedures, minimize discomfort for the patient and provide the dentist with easier to use, more reliable instruments and materials. By doing so, the dental industry is helping the dentist to better apply his knowledge, skill and judgment, the vital ingredients of good dental care.

Teledyne, Inc. and Subsidiaries

Consolidated Statements of Income

	Three Months Ended September 30		Nine Months Ended September 30	
	1977	1976	1977	1976
Consolidated Sales	**$550,710,000**	$480,993,000	**$1,621,206,000**	$1,422,820,000
Consolidated Costs and Expenses:				
Cost of sales	**404,045,000**	354,361,000	**1,202,443,000**	1,064,150,000
Selling and administrative expenses	**66,765,000**	63,634,000	**200,336,000**	186,307,000
Interest expense	**4,218,000**	4,532,000	**12,749,000**	14,533,000
Interest income	**(2,400,000)**	(1,991,000)	**(7,348,000)**	(6,519,000)
Provision for income taxes	**39,400,000**	31,000,000	**108,700,000**	83,800,000
	512,028,000	451,536,000	**1,516,880,000**	1,342,271,000
Income of Consolidated Companies	**38,682,000**	29,457,000	**104,326,000**	80,549,000
Equity in Net Income of Unconsolidated Subsidiaries, after allocated interest expense and income tax credits (excludes equity in unrealized depreciation on marketable equity securities)	**14,103,000**	4,910,000	**17,860,000**	18,998,000
Net Income	**$ 52,785,000**	$ 34,367,000	**$ 122,186,000**	$ 99,547,000
Net Income Per Share:				
Primary	**$4.42**	$2.80	**$10.20**	$7.56
Fully diluted	**$4.32**	$2.75	**$ 9.98**	$7.35

Consolidated Balance Sheet

	September 30, 1977
ASSETS:	
Current Assets:	
Cash and marketable securities	$ 209,161,000
Receivables	266,886,000
Inventories	165,004,000
Prepaid expenses	6,364,000
Total current assets	647,415,000
Investments in Unconsolidated Subsidiaries, after reduction of $32,967,000 for equity in unrealized depreciation on marketable equity securities	370,029,000
Property and Equipment, less accumulated depreciation of $287,993,000	236,017,000
Other Assets	38,152,000
	$1,291,613,000
LIABILITIES:	
Current Liabilities:	
Accounts payable	$ 92,301,000
Accrued liabilities	157,000,000
Accrued income taxes	68,100,000
Current portion of long-term debt	5,552,000
Total current liabilities	322,953,000
Long-Term Debt	310,698,000
Other Long-Term Liabilities	75,791,000
Shareholders' Equity, after reduction of $32,967,000 for equity in unrealized depreciation on marketable equity securities of unconsolidated subsidiaries	582,171,000
	$1,291,613,000

Review

QUARTER AND NINE MONTH RESULTS

Net income, earnings per share and consolidated sales for the third quarter and first nine months of 1977 improved over the comparable periods of a year ago.

For the third quarter net income was $52,785,000 compared to $34,367,000 for last year's third quarter. Net income per share was $4.42 versus $2.80 last year. Consolidated sales for the quarter were $550,710,000 against $480,993,000 in the 1976 quarter.

For the nine month period net income was $122,186,000 or $10.20 per share compared to $99,547,000 or $7.56 a year ago. Consolidated sales increased to $1,621,206,000 from $1,422,820,000.

During the third quarter there were 11,842,448 average shares outstanding down from 12,100,337 a year ago. During the nine month period there were 11,848,866 average shares outstanding compared to 12,961,830 for the same period in 1976.

INSTRUMENTATION FOR LIQUIFIED NATURAL GAS CARRIERS

An instrumentation system to record engineering data on the first of a new class of ships being built to transport liquified natural gas has been designed and installed by Teledyne Engineering Services.

These unique vessels transport natural gas which has been liquified by reducing its temperature to −260° F. The liquified gas is contained aboard the ship in five spherical aluminum tanks, each weighing 850 tons and measuring 120 feet in diameter.

Teledyne instrumentation will provide stress and motion data on the aluminum tanks and their supports under these extreme cryogenic conditions during the first year of operation. The data derived will be correlated with weather, seaway and ship operational data and used in the design verification of these and future liquified natural gas carriers.

The transportation of liquified natural gas under cryogenic temperatures is a new and increasingly important element in the worldwide transportation of energy.

IMPROVED JET ENGINE MAINTENANCE

A new portable unit that greatly speeds and simplifies the cleaning of fuel nozzles on certain commercial jet engines has been jointly developed by Teledyne Sprague Engineering and Trans World Airlines. The equipment is designed specifically for use on the Pratt and Whitney JT8D engine which is widely used on such commercial aircraft as the Boeing 727 and 737, and the Douglas DC-9.

Fuel injection nozzles and guide vanes of jet engines require periodic cleaning to remove residues of carbon and fuel varnish which build up during use. Heretofore, the engines had to be removed from the aircraft and partially disassembled to accomplish this cleaning procedure by hand, involving many hundreds of hours of expensive maintenance work for commercial aircraft fleets.

The new equipment is a wheeled cart that pumps an approved cleaning detergent through the engine nozzles under high pressure, in a cyclic cleaning process that takes about 45 minutes per engine, with the engine still on the aircraft. The process simply involves disconnecting the main fuel line to each engine and connecting a flexible hose from the cart.

The cleaning unit, which is entirely non-electric for safe use in any atmosphere, is powered by compressed air at 100 pounds per square inch from any shop source and is automatically controlled by pneumatic logic modules.

PORTABLE SEISMIC RECORDER

Teledyne Geotech recently introduced a compact recording system which may be combined with a Geotech seismometer to provide a complete portable seismograph system.

Designated the RV-320 Portacorder, the instrument has a built-in, crystal-controlled, microprocessor-based timing system and will record seismic signals for periods of up to 115 hours before the internal batteries require recharging.

Incorporating the latest electronic and seismic recording technology, the low-cost Portacorder is designed for use in studies related to earthquake prediction, volcanic eruption, dam subsidence and other geological phenomena.

MOLDED RUBBER PARTS FOR FORD

For the past several months Teledyne Monarch Rubber has been participating in the development of two new compact automobiles, the Ford Fairmont and the Mercury Zephyr, both of which will be introduced this fall for the 1978 car season. The company has made over 8000 engineering sample rubber parts for the Ford laboratory facilities. From these have come the molds for 18 actual parts that Teledyne Monarch Rubber will produce for each Fairmont and Zephyr.

These include front and rear suspension bushings, complete rear control arms and bushings, isolation bushings for a transverse chassis member, and all engine mounts.

About 450,000 Fairmonts and 150,000 Zephyrs are expected to be built during the 1978 model season. Teledyne Monarch Rubber has been a leading rubber and rubber-to-metal component supplier to Ford for almost 30 years and is one of Ford's top fifty outside suppliers.

UNINTERRUPTIBLE POWER FOR SOCIAL SECURITY ADMINISTRATION

Teledyne Inet was recently chosen by the Social Security Administration to provide an Uninterruptible Power System for the agency's dual IBM 370/168 Teleprocessing Complex. These computing systems provide on-line, real-time data base communications through both conventional land lines and satellite communications with over 1500 Social Security Administration offices in the fifty states, Puerto Rico and the Virgin Islands.

In the event of power loss or brownouts, the Teledyne system will sustain the critical computer load for a minimum of ten minutes, allowing the normal return of utility power or the orderly shut-down of computer operations. The system is totally redundant with all modules operating in parallel to provide continuous power even during partial equipment failure or maintenance shutdowns.

The high reliability expected from the Uninterruptible Power System will minimize computer down-time and maintenance costs, increase computer system availability and provide improved service for the Social Security Administration's 200 million accounts.

HYDROGEN-FUELED VEHICLE STUDY

A contract to study near-term applications for a hydrogen-fueled vehicle has been awarded to Teledyne Continental Motors General Products Division by the Brookhaven National Laboratories under the auspices of the Energy Research and Development Administration (ERDA).

The study will provide a concept design for the vehicle, including a hydrogen storage system, and will investigate possible problem areas and propose solutions to those problems. The program will cover both the powerplant and automotive aspects of hydrogen-fueled vehicles.

CAE TURBINES IN SWEDEN

The Teledyne CAE turbojet engine, which powers the U.S. Army MQM-107 Variable Speed Training Target drone, performed faultlessly during initial flight testing in Sweden. Under the Foreign Military Sales Program, the Swedish government has procured the aerial target system from the U.S. Army. The target drone, nicknamed "Streaker", will be used by the Swedish military services for the evaluation of new weapons as well as the training of both the air and ground forces.

Sweden is the first of several foreign countries expected to put the new drone into operational use. The initial, early April flights on a test range in northern Sweden marked the first time the vehicle has been flown outside the United States. Successful operations in an area so close to the Arctic Circle demonstrates the versatility of the target and the turbojet engine.

SOLID STATE MICROWAVE AMPLIFIERS

Teledyne MEC recently began the manufacture of solid state amplifiers used to enhance microwave signals for such applications as electronic countermeasures, satellite and ground based communications and radar. The heart of the new solid state amplifier is a gallium arsenide field effect transistor manufactured on special thin-film crystal growing equipment designed and built by Teledyne MEC. The new equipment represents a significant state-of-the-art advance in the technology of producing "controlled growth" crystal material.

LICENSING AGREEMENT

Teledyne Ryan Aeronautical has entered into an exclusive licensing agreement with Martin-Baker Aircraft Co. Limited, a British firm, to manufacture and sell Martin-Baker Mark 10 aircraft ejection seats in the United States. The Mark 10 is the latest version of these world renowned ejection seats. Over 46,000 seats have been manufactured, which are credited with saving more than 4,200 lives. The Mark 10 is currently used in several European aircraft and in the U.S. Navy's new F-18 lightweight fighter aircraft.

The companies have agreed to mutual technical assistance in developing lighter weight escape systems of comparable performance, quality and reliability to the present products.

Initially, most component parts for the Mark 10 will be supplied by Martin-Baker, with assembly and testing by Teledyne Ryan in San Diego. Eventually, Teledyne Ryan will build a larger share of the system in the United States.

HEAVY WALL TUBE FABRICATION

Fabrication of a critically-important main bearing column and outer bearing housings for a launch pad modification in the Space Shuttle program at Cape Canaveral was completed earlier this year by Teledyne Irby Steel. The project involved the difficult process of rolling 8-inch thick high strength steel plate to an inside diameter of 4 feet 10 inches and circumferentially welding sections together to meet length requirements.

The process was made possible by Teledyne Irby's heavy wall structural pipe and plate bending equipment with forming capacities of 2 to 14 feet in diameter and wall thickness up to 9½ inches.

ANNUAL HIGH SCHOOL ARTIST CONTEST

Awards of $7000 were made in July of this year to winners of the sixth annual Calendar Art Contest for high school students, sponsored by United Insurance Company of America, a subsidiary of Teledyne, Inc. First place award of $1000 went to Amy Guynup of Haddon Heights, New Jersey, for her oil painting entitled "Vermont Country Church," shown below. In addition to the cash award, the winning painting will appear on United Insurance Company calendars for the year 1978.

In addition to the first place prize, four $500 prizes, twenty $100 prizes and eighty $25 prizes were awarded, as well as one hundred certificates of merit.

The contest began as a local event in 1972 with 60 entries, and has grown to a national event with almost 700 entries this year. More than $50,000 has been awarded to over 500 high school artists out of approximately 3000 entries.

Each year, the winning entries are selected by a panel of distinguished professional artists, art critics and art instructors. The object of the program is to encourage high school level artists and provide the most talented with cash scholarship assistance for their future training.

This Teledyne Report outlines Teledyne's participation in the field of materials, instruments and equipment for professional dentistry. Teledyne Dental products range from high speed air-turbine handpieces, carbide and diamond drilling burs and articulators used in the modern dental operatory, to casting machines, dental engines and lathes, bunsen burners and alcohol torches used in the dental laboratory. Materials include impression compounds, filling materials, denture base acrylics and cements for dental use. These products are sold under such well-known and long-established brand names as Ames, Blu-White, Densco, D-P, Emesco, Getz, Hanau, Opotow and Lee Smith.

TELEDYNE REPORT featuring subjects of particular interest from Teledyne activities, is issued on a quarterly basis. Previous topics include:

Space Navigation: Whether the payload is a spacecraft for Mars or a satellite for earth orbit, the first minutes of flight, under the guidance of an on-board computer, are the most critical to the success of the mission.

Analytical Instruments: Detecting and measuring small amounts of specific substances in large volumes of other materials is the key to controlling many vital processes.

1776-1976: A look back at various technologies as they were two hundred years ago, compared with the technologies of today and Teledyne's involvement in them.

Life Insurance: This largest segment of the insurance industry not only provides financial security for millions of families and individuals, but is also one of the nation's major sources of investment capital.

The Refractory Twins: Two high melting point metals, tungsten and molybdenum, play versatile and vital roles in every modern industrialized society.

The Instrument Makers: Teledyne's oldest company goes back 131 years. From surveying the Old West, to moon mapping and machine tool encoders, its history is the history of the technology of measuring.

Industrial Engines: Compact portable power from gasoline and diesel piston engines has taken the drudgery out of manual labor. Now the goal is to reduce noise and emissions.

Job Corps: A decade of motivating and training a half million alienated and disadvantaged young people has produced some remarkable new teaching methods . . . and a lot of good citizens.

Friendly Explosives: Using explosives to save lives in aircraft emergencies may sound unlikely, but it's the safest, fastest, most reliable method ever developed.

Microelectronic Hybrids: From vacuum tube to transistor to integrated circuit, the history of electronics has been one of fitting more and more complex electronic circuitry into less and less space. A hybrid microcircuit is a sophisticated form of microelectronic packaging that goes a step beyond the individual large scale integrated circuit.

The Energy Options: Nuclear fuels and coal are both abundant enough to make a significant contribution to U.S. energy needs over the next several decades. Unlike many other energy sources, the technology to use them on a large scale exists today.

Workmen's Compensation Insurance: Most working people are already protected. The goal is coverage for every employed person.

Drilling for Offshore Oil: Almost half our national resources of oil and gas are believed to lie under offshore waters. The technology for getting them out is here — but it won't be easy.

The Search for Oil: With supplies dwindling and demand growing, sophisticated geophysical techniques are being brought to bear on the problem of locating new oil deposits.

High Speed Tool Steels: These precision, premium-priced alloys are vital to the production of virtually every commodity we use in modern life.

Energy Crisis in the Computer Room: As the quality of utility electrical power falls off and brownouts and blackouts become more common, the incidence of computer failures goes up. Solid-state Uninterruptible Power Systems can solve the problem.

Raydist: This ultraprecise electronic navigation system can pinpoint locations at sea with sensitivity of one and a half feet at ranges of up to 250 miles from base stations.

Welding: One of industry's most versatile production techniques, welding is used in the manufacture of virtually every type of fabricated metal product made today.

General Aviation Engines: Propeller driven aircraft powered by conventional piston engines are not only alive and well more than 30 years after the advent of the jet, they dominate air activity today.

Rubber: Rubber compounds are being called on to do new technological jobs in applications ranging from industrial tires to Teledyne's new automotive bumper system that will dissipate five-mile-per-hour impacts.

Loran: Loran was one of the first all-weather electronic navigation systems. Recent Teledyne innovations have lowered costs and greatly improved its range and accuracy.

Seismology: This relatively young science has expanded from the classic study of earthquakes to become an important tool in oil and mineral exploration, detection of underground nuclear explosions and earthquake hazard reduction.

Casting: The simple process a small boy uses when he casts a tin soldier is the basis of a high technology industry that produces items ranging from high temperature turbine blades to 90-ton steel mill rolls.

AIDS: Aircraft Integrated Data Systems keep a running record of the vital functions of the new jumbo jets and provide airlines with an important tool for lowering costs associated with maintenance, fuel management and crew proficiency testing.

Thermoelectrics: Generators that convert heat directly into electricity are providing a practical new power source for applications ranging from space exploration to remote weather stations.

Thin Metals: Less becomes more when space-age metals are rolled out into thin strip and foil. These new materials, already being used in thousands of products, are making new metal-working techniques possible.

The Reproduction of Music. Men began experimenting with methods of recording sound over 150 years ago, but it remained for electronics and some very recent developments to allow music to be reproduced with concert-hall realism.

The Crowded Spectrum: The lower portion of the radio spectrum is already overcrowded with hundreds of wireless services. Microwave devices such as the traveling wave tube are opening higher frequencies for practical use.

Science and Cinematography: Modern techniques of slow motion cinematography let scientists and engineers analyze actions and events that happen too fast for the eye to follow.

Superalloys: Materials that retain high strength at temperatures approaching 2000°F make the jet age possible.

Jets of Water for Dental Health: Studies show that high-pressure pulsed jets of water are a valuable aid in the care of teeth and gums.

The Last Eight Miles: The controlled descent to the surface of the moon was accomplished through use of a century-old principle called the Doppler effect.

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