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CHARACTERISTICS OF METEOR TRAILS GIVEN. A description of the phenomena associated with meteor trails is given in a report on several observations as presented in a paper by P. M. Millan (AIAA Journal, Vol. 1, No. 5). On the basis of optical cameras and radar equipment, the luminosity and ionization along the trajectories of bright meteors is discussed.

The visible portion of an observed meteor moving down its trajectory is not the meteoroid itself, the author notes, but the glow of atoms and molecules surrounding it. It has been observed that its rapid angular motion across the sky masks the actual form of the meteor head, even though it may be large

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enough for resolution by the eye. Conventional photographic analysis is similarly handicapped, and the bright image results in the various effects of photographic diffusion. An occulting shutter installed on the camera, either in front of the lens or immediately in front of the emulsion, is very useful for the study of moving meteor images.

In early studies of meteor trails using such cameras, a wake was observed, in most cases extending from 20 to 200 m (66 to 660 ft) behind the meteor head. Generally, the integrated luminosity of the wake was considerably less than 0.1 the luminosity of the head. The wake of the very bright, fast meteors probably consists of trailing atoms and molecules; the fainter and slower meteors have wakes consisting of fragmented particles in addition to the atoms and molecules.

Radar observations of meteors have shown echoes produced by the clouds of electrons left behind along the meteor trajectory. Most of the enduring meteor echoes occur at heights from 80 to 115 km (50 to 75 mi) and have a peak frequency near 98 km (60 mi). A different type of echo, a "moving-ball" radar target, has been observed to travel at the velocity of the meteoroid, appearing at the highest point of the trajectory. A complete physical explanation for this phenomenon has not been made, although it is possible that ionization caused by ultraviolet light from the head is a factor.

In concluding, the author writes: "Trailing behind the ablating and/or fragmenting meteoroid may be a wake of lower-level atomic emissions, a metastable train of neutral oxygen luminosity, a persistent train of long duration radiations, and an ionized cloud of particles that act as an enduring radar target."
(Source: AIAA Journal, May 1963)

LOW COST LASER POSSIBLE WITH HELIUM-NEON TUBE. A new, low-cost, continuous-wave gas laser tube (Fig. 1) has been developed by PEK Laboratories, Inc., Sunnyvale, California. Their Type LT 11 helium and neon filled gas laser tube is described as very economical. A wide range of laser investigations is possible with the addition of only a rf power source, optical bench, and confocal mirrors. The gas laser tube will then produce a highly collimated beam of truly monochromatic light, guaranteed to operate at 6328 Å.

The new gas laser tube is rf excited, requiring 75 w input at 27.1 Mc. The power output is approximately 2 mw at 6328 Å or 1.153 μ. A quartz tube of 7 mm (0.28 in.) outside diameter and 5 mm (0.20 in.) inside diameter is

used. The optical quality Brewster angle windows are 50 mm (2 in.) borosilicate glass. The overall length of the completed laser tube is 110 cm (45 in.). Precise techniques developed at PEK Laboratories, Inc. for filling and sealing the tube, make it possible to guarantee 300 hr of operation. (Source: Data supplied by PEK Laboratories, Inc.)

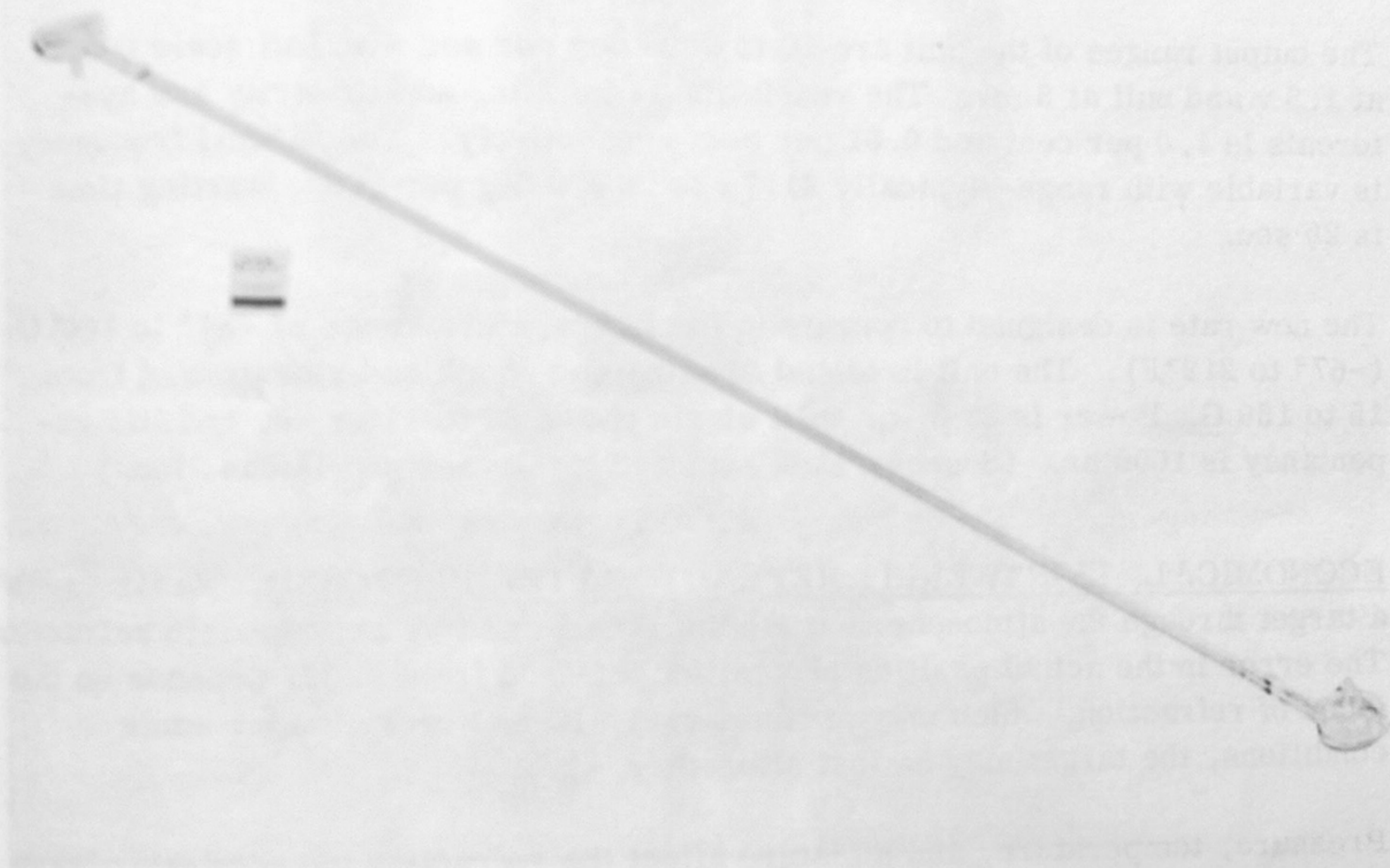


FIG. 1

NEW MICROMINATURE RATE GYRO INTRODUCED. A new, microminature rate gyroscope that eliminates conventional gimbals was demonstrated recently by Special Devices Laboratories, Inc. The highly-sensitive microminature gyro measures less than 1.6 cm^3 (1 in.^3) and weighs 43 g (1.5 oz.). The low cost instrument, used as a sensing or controlling device for a wide range of aerospace applications, incorporates a new approach to gimbaling by eliminating float arrangements, delicate bearings, torsion bars and critical pickoffs without any loss of sensitivity. The angular momentum of the device is $62,500 \text{ gm-cm}^2$ per sec.

According to the company, this instrument is the smallest rate gyro in existence. It is intended for use in missiles, special weapons and space vehicles, and it serves as a replacement for larger gyros.

The new gyro (Fig. 2) uses a highly efficient synchronous motor to drive a hysteresis wheel and is capable of a wide range of full scale calibration. The unit consists of four basic assemblies: (1) The base provides headers for electrical connection, registration for the output axis, and mounting. (2) Four coils in an inductive bridge arrangement make up the detector. (3) The gimbal assembly provides the single axis freedom, damping, and mounting for the spin motor. (4) The motor assembly.

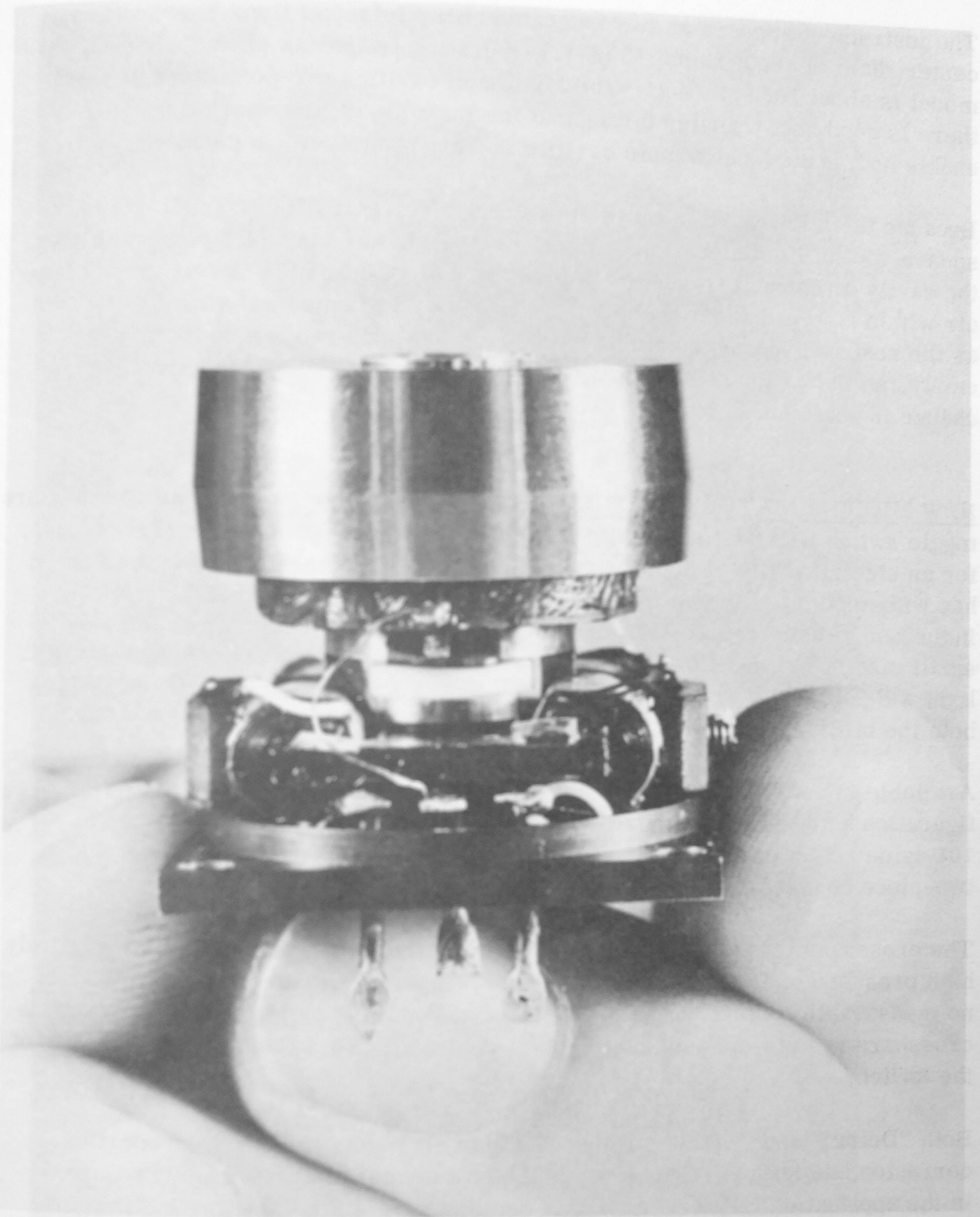
The output ranges of the unit are 10 to 2000 deg per sec with full scale output at 1.5 v and null at 5 mv. The resolution is infinite, and linearity and hysteresis is 1.0 per cent and 0.01 per cent respectively. The natural frequency is variable with range--typically 41.7 cps at 200 deg per sec. Starting time is 20 sec.

The new rate is designed to operate in the temperature range of -54° to 100° C (-67° to 212° F). The unit is tested to withstand shock and vibration of from 15 to 150 G. Power is 2, 3, or split single phase 26 to 115 v ac, and life expectancy is 1000 hr. (Source: Data supplied by Gaynor and Ducas, Inc.)

ECONOMICAL, LIGHTWEIGHT REFRACTOMETER PROPOSED. Radar "sees" a target through the atmosphere at a point determined by atmospheric refraction. The error in the actual position of a target obtained from radar depends on the index of refraction, which may at times cause large errors; under some conditions, the target may be lost altogether.

Pressure, temperature, and moisture affect the refractive index at microwave frequencies. By taking readings of these parameters, one may compute the microwave index of refraction at any point in the atmosphere. Although instrumentation and procedures exist for refractive index measurements, available techniques are time consuming, heavy, and are expensive or inaccurate.

A device has been proposed for indicating the index of refraction directly: it would need to be lightweight and economical for use aboard conventional weather sounding balloons, while providing the necessary accuracy imposed by the equipment with which it would be used. A refractometer designed to meet these conditions is now being developed by the Air Force Cambridge Research Laboratories (AFCRL). The instrument consists of a dual microwave cavity, with one end open to the air. A second cavity is sealed and connected to the exposed cavity.



and the color is "X-ray" to take advantage of better focusing properties made possible by putting the two lenses.

FIG. 2

The instrument appears as two truncated cones joined at their bases, with a center diam of about 13 cm (5 in.). Operating frequency of the proposed model is about 1000 Mc/sec. The aluminum cavities are positioned so that there is good heat transfer throughout the instrument; thermal properties enable both sealed and sample cavities to "drift together" in parallel.

Because the microwave index of atmospheric refraction is proportional to the square root of its dielectric constant, neglecting any magnetic permeability, the cavity's resonant frequency is proportional to the index of refraction of the air within it. As indicated above, air is allowed to enter only one cavity, and as the resonant frequency of one cavity changes with respect to the other cavity, an indication of the magnitude and direction of any refractive index change is obtained. (Source: OAR, Research Review, May 20, 1963)

NEW MICROMINIATURE SWITCH DESCRIBED. A new patented microminiature toggle switch with extremely high reliability has been designed by Telex, Inc., for an electrical life of 500,000 break-and-make cycles. The switch (Fig. 3) has withstood more than a million cycles in test runs without failure or any indication of detrimental wear or fatigue. Its dependability, along with its small size of 0.4 cm x 0.33 cm x 1.2 cm (0.16 in. x 0.13 in. x 0.50 in.) and light weight (0.17 g or 0.006 oz), makes it ideal for space age applications in both the military and industrial fields.

Available in both single pole/single throw and single pole/double throw configurations, the switch consists of a rotor and arm molded in Du Pont "Zytel" 101 nylon resin; crossbars and terminals made of a noble metal alloy; and a two-piece housing molded in Du Pont "Delrin" acetal resin.

The crossbars, inserted through the rotor, established contact at the relatively high pressure of 150 g (5.3 oz), reducing impact to a point at which there is no measurable contact bounce. The continual wiping or cleansing action of the crossbars results in consistent contact resistance (0.120 ohm) over the life of the switch.

Both "Delrin" and "Zytel" possess the high strength, dielectric properties, corrosion and fatigue resistance, and high thermal distortion point required in the application. However, it was decided to mold the housing in "Delrin" and the rotor in "Zytel" to take advantage of better bearing properties made possible by pairing the two resins.

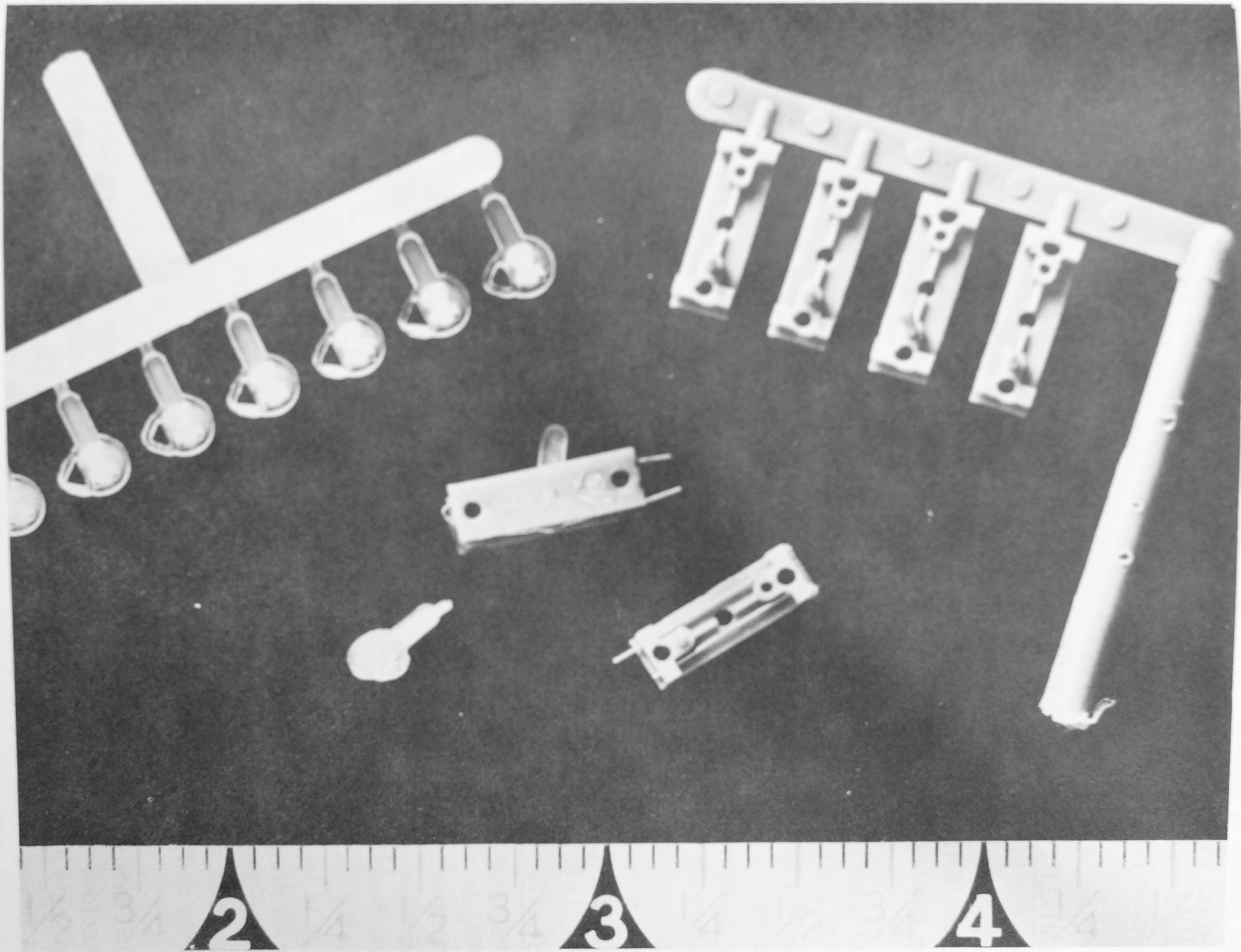


FIG. 3

The switch is expected to be applied in microminiature electronic devices, medical instruments, test points on printed circuit boards, communications equipment, and modular components. (Source: Data supplied by E. I. Du Pont De Nemours and Company)

SEMI-AUTOMATIC DRY BLAST FINISHING UNIT INTRODUCED. A console-type dry blast unit (Fig. 4), designed for finishing a wide variety of small parts, has been introduced by Pressure Blast Manufacturing Company, Inc. Unique features of the machine include cleanliness of operation, finishing speed, and compactness.

The blast cabinet is fabricated of heavy gauge steel and measures 93 cm wide by 48 cm deep by 80 cm high (37 in. by 19 in. by 31 in.). Within the cabinet are four fixed blast guns held on adjustable mounts. The operator manually places the part to be finished through the work-loading aperture at the top of the cabinet, actuates a foot pedal, and blast action begins. To insure absolute uniformity of finish from part to part, a timing mechanism is provided that determines the blast cycle. This cycle may be adjusted as required by the work to be accomplished. (Source: Data supplied by Smith, Doriah and Burman, Inc.)

THE IGY: A STUDY IN SCIENTIFIC COOPERATION. The International Geophysical Year (IGY), which lasted from July 1, 1957 to December 31, 1958, involved at its height some 30,000 scientists, engineers, and technicians. A thorough geophysical study of Antarctica was the goal of 57 stations set up and maintained there by Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union, the United Kingdom, and the United States. In different parts of the world, 52 observatories took part in the "solar patrol." The IGY was organized for the study of three major disciplines: the Earth's atmosphere and solar-terrestrial relationships; the Earth's surface phenomena; and the internal structure of the Earth. It now seems fitting to look at the program in retrospect for some of its achievements and their contributions to scientific research.

Good data were obtained concerning solar disturbances; the program practically coincided with the maximum sunspot cycle. One of the 52 observatories watching the Sun's activity -- the Royal Observatory at the Cape of Good Hope -- recorded 694 flares within 9.5 months. Off the California coast, Nike-Cajun rockets, launched within minutes of an expected solar flare, contained equipment to measure Lyman α radiation and X-radiation in bands between 20 and 2 Å emitted by the Sun. Although no increase in Lyman α radiation was observed after the flare, X-radiation experiments revealed an increase in relative intensity of the shorter wavelengths.



FIG. 4

Other examples of successful rocket soundings by both the United States and the Soviet Union covered a wide variety of upper atmospheric phenomena. Launchings were spaced over a considerable range of latitudes. A series of launchings was carried out by "rockoons", or balloon-lofted rockets, from a ship sailing from California to Antarctica. Among the many observations made, perhaps the most interesting study dealt with the equatorial electrojet, an electric current system that flows around the geomagnetic equator at a height of about 100 km (62 mi). About 10 to 20 km (6 to 12 mi) in depth and about 300 km (180 mi) in width, it is responsible for strong magnetic field variations at equatorial latitudes. Sensitive magnetometers aboard the rockoons were used to investigate the electrojet.

Other activities and discoveries made during the IGY were so numerous that only a few of the more outstanding will be mentioned here. A solar eclipse on October 12, 1958, was investigated by the use of sounding rockets. The experiment revealed a decrease in ultraviolet radiation intensity during the eclipse, while that of the X-rays was unchanged.

Soon after the first satellite launchings, a better determination of the Earth's equatorial and polar diameters was made. Analysis of satellite orbits yielded a large amount of other data: air density, for example, was indirectly indicated by the satellite's orbital decay rate.

The oceanographic program and the Antarctic program were so successful that international cooperation is still continuing in these areas of exploration. The Special Committee for Oceanographic Research (SCOR) is in full operation, as is the Special Committee for Antarctic Research, to name but two of the several international research organizations that were direct products of the IGY.

During the IGY program, an enormous amount of data was gathered over a wide range of subjects, and new information is becoming available as analysis continues. Not only the wealth of information gained but also the number and the success of nations cooperating in a peaceful enterprise are lasting achievements of the program. (Source: Endeavour, May 1963)

VIBROMETER TO BE MARKETED. A small low-cost vibrometer that will measure vibrations accurately and quickly without the aid of computers or other expensive equipment will be on the market soon. The Boeing Company and Allegany Instrument Co. are producing the vibrometer.

The tiny instrument was developed for use in measuring skin vibrations on wind tunnel models of space vehicles. It employs a metal beam to which has been fastened a strain gauge. The bending of the beam is measured by the strain gauge and accurately indicates amount of vibration of the part to which the vibrometer is attached.

The "Vibrasensor," as it is called, has several advantages: it is small and has little effect on the vibrations it is measuring; it measures the total distance of the vibration in each direction without requiring a separate measuring instrument; it can be read out on standard laboratory equipment; and it is relatively inexpensive. Work is proceeding on development of units which will operate well above 537° C (1000° F). (Source: Data supplied by The Boeing Company)

TWO-IN-ONE MICROSYN DEVELOPED. A two-in-one microsyn (Fig. 5) is now available from the Sperry Electro Devices Laboratory. The component does jobs in inertial navigation packages usually requiring two separate microsins and is no increase in size over standard units.

It is a combination D. C. torquer and A. C. pickoff suitable for use either with gyroscopes or accelerometers and has proved itself in actual system operation. An added feature is a permanent magnet rotor which eliminates the need for a current regulator in the system.

Typical data for a 25.4-mm (1-in.) O. D. microsins has a pickoff which includes input of 5 volts at 6.4 kc; output of 0.5 volts/degree; linearity (range $\pm 1^\circ$) of 1%; and impedance of $88 + j235$ ohms.

The torquer includes input of 0 - 5 ma; output of 100 cycles-cm/ma; and linearity (range ± 5 ma) of 1%. These values can be varied to meet individual requirements. (Source: Data supplied by Sperry Gyroscope Co.)

TECHNICAL REPORTS AVAILABLE. The following listed technical reports can be requested through the NASA library, M-MS-IPL, Bldg. 4481.

NOTE: Those reports with an AD number may be on file in the local DDC branch in Bldg. 4484. Readers can save time by calling 876-6088 and inquiring if such reports are available before ordering them through NASA.

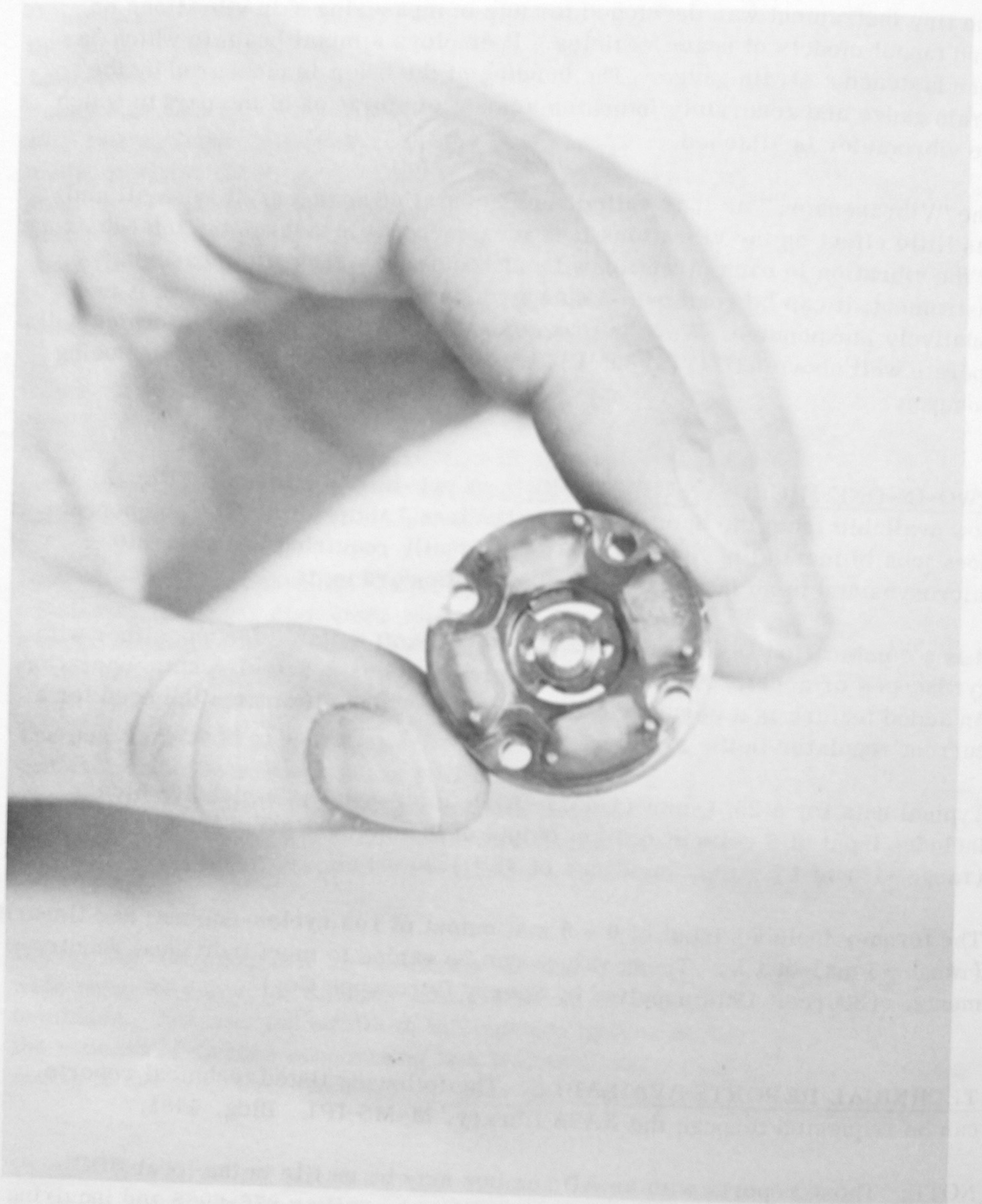


FIG. 5

1. RESEARCH ON THE ELECTROLYSIS OF WATER WITH A HYDROGEN-DIFFUSION CATHODE TO BE USED IN A ROTATING CELL, J. Clifford and C. Faust. AD 289 024
2. DESIGN AND DEVELOPMENT OF REGENERATIVE CARBON DIOXIDE SORBERS, H. W. Chandler et al. AD 293 224
3. BIOLOGISTICS FOR SPACE SYSTEMS SYMPOSIUM, J. Robinette. AD 292 713
4. GROUP PERFORMANCE DURING FOUR HOUR PERIODS OF CONFINEMENT, E. A. Alluisi and T. J. Hall. AD 283 842
5. STUDIES IN RESEARCH METHODOLOGY, III--PERSISTENCE OF SEQUENTIAL EFFECTS DESPITE EXTENDED PRACTICE, J. V. Bradley. AD 283 976
6. OUTER SPACE ENVIRONMENT MODES FOR USE WITH SPACE VEHICLE SIMULATORS, W. A. Livingstone. AD 283 284
7. HUMAN ENGINEERING BIBLIOGRAPHY, Institute for Psychological Research, Tufts University for the U. S. Navy. PB 181 179
8. A BIBLIOGRAPHY ON AIRCREW PROFICIENCY MEASUREMENT, Robert Buckhout. AD 283 545
9. TIME DISORIENTATION AND ESTIMATION IN ISOLATION, M. B. Mitchell. AD 277 148
10. IMAGERY AND SENSORY DEPRIVATION, AN EXPERIMENTAL STUDY, P. H. Leiderman. AD 282 853
11. MOTIVATION AND THE AUTOMATION OF TRAINING--A LITERATURE REVIEW, A. Ugelow. AD 277 287
12. A BIBLIOGRAPHY OF REPORTS ISSUED BY THE BEHAVIORAL SCIENCES LABORATORY: ENGINEERING PSYCHOLOGY, TRAINING PSYCHOLOGY, ENVIRONMENTAL STRESS, SIMULATION TECHNIQUES AND PHYSICAL ANTHROPOLOGY, L. J. Thomas. AD 282 281

13. BARALYME AND MOLECULAR SIEVE PASSIVE AIR REGENERATION STUDIES FOR MANNED SEALED ENVIRONMENTS, D. A. Keating. AD 283 845
14. RESEARCH AND DEVELOPMENT ON CLOSED RESPIRATORY SYSTEM ACCESSORIES, T. L. Willard. AD 272 919
15. EFFECTS OF IONIZED AIR ON DECISION MAKING AND VIGILANCE PERFORMANCE, Various authors. AD 283 460
16. WEIGHTLESSNESS AND PERFORMANCE, A REVIEW OF THE LITERATURE, J. P. Loftus and L. R. Hammer. PB 181 030
17. WEIGHTLESSNESS--TRAINING REQUIREMENTS AND SOLUTIONS, B. G. King and others. AD 259 512
18. RESEARCH ON THE ELECTROLYSIS OF WATER UNDER WEIGHTLESSNESS CONDITIONS, J. Clifford and others. AD 283 255
19. TOXICITY OF BERYLLIUM, J. Cholak and others. AD 276 640
20. DESIGN AND DEVELOPMENT OF A LIQUID METAL FUEL CELL, B. Agruss et al. AD 296 861
21. HELIUM-PURIFICATION UNIT FOR HIGH-PURITY INERT-ATMOSPHERE BOXES, M. S. Foster et al. ANL 6652
22. RESEARCH ON SOUND PROPAGATION IN SOUND-ABSORBENT DUCTS WITH SUPERIMPOSED AIR STREAMS, Volume I., F. Mechel. AD 296 946
23. RESEARCH ON SOUND PROPAGATION IN SOUND ABSORBENT DUCTS WITH SUPERIMPOSED AIR STREAMS, Volume II., F. Mechel and W. Schilz. AD 296 985
24. RESEARCH ON SOUND PROPAGATION IN SOUND ABSORBENT DUCTS WITH SUPERIMPOSED AIR STREAMS, Volume III., F. Mechel, P. Mertens and W. Schilz. AD 296 984
25. PHYSICAL METALLURGY OF TUNGSTEN AND TUNGSTEN BASE ALLOYS, H. G. Sell et al. AD 293 841
26. TUNGSTEN FORGING DEVELOPMENT PROGRAM, E. J. Breznyak and F. N. Lake. AD 294 951