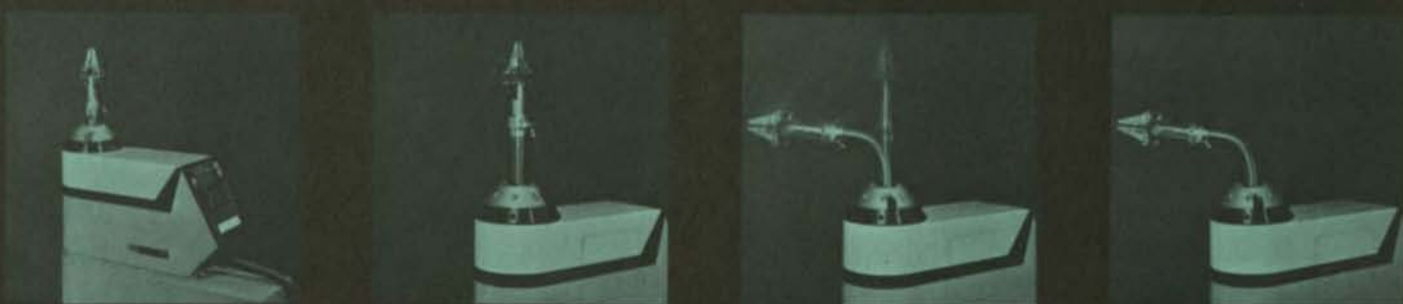
AMERICAN MACHINE & FOUNDRY COMPANY
RESEARCH & DEVELOPMENT DIVISION
689 HOPE STREET, SPRINGDALE, CONNECTICUT

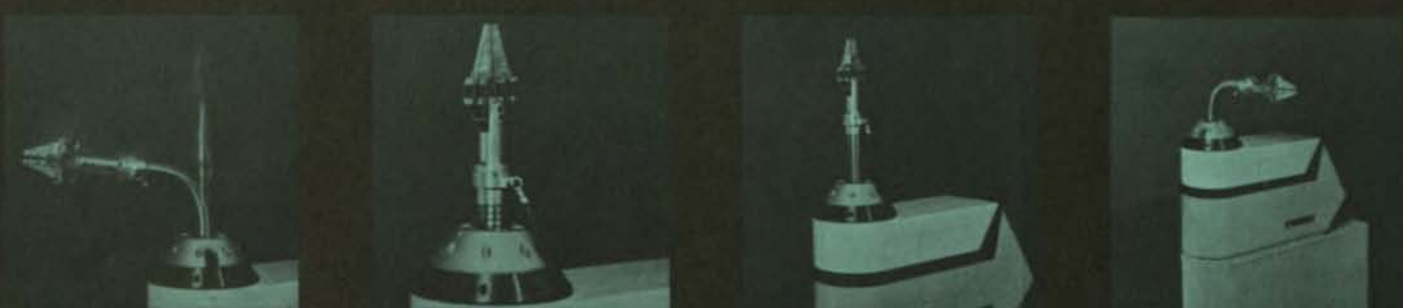
R&D newsletter

APRIL–JUNE 1963

VERSATRAN...



FLEXIMAN...



FOR MORE than half a century AMF has been active in the design and development of automatic systems. The cigar making machine, the pretzel tying machine, and the bowling Pinspotter are cases in point. In these and other instances, the introduction of AMF automatic machines made possible substantial growth in industries that had reached their limits of productivity with conventional methods.

In one sense of the word, therefore, "automation" is a tradition at AMF. Since the time the word was coined, in 1946, automation has captured the imagination of the public, and consequently has taken on many different meanings and connotations. For AMF, however, the word remains one facet of the larger concept, "systems engineering."

The AMF systems engineer views each production problem as a unique one. His solution may include the traditional type of automation, but if it does, it will be on the basis of a consideration of all the important factors involved, including capital investment, labor, flexibility, unit manufacturing cost, and plant capacity.

Automation History in the Making • AMF's family of automatic transfer machines, consisting of FLEXiMAN and VERSATRAN, was shown publicly for the first time at the annual American Society of Tool and Manufacturing Engineers show, held April 29 to May 3 in Chicago. The units were in constant operation, demonstrating their ability to carry out exacting transfer operations tirelessly and accurately.

Flexible Automation

With the increasing profit squeeze, more and more manufacturers have looked to automation, only to find that its benefits could be obtained only at the cost of large capital outlays for machines, tooling, and plant set-up, together with a long-term commitment to a particular product, production method, and schedule. Often opposed to this approach are the needs of the market place, in which, increasingly, the consumer has come to expect rapid continuing improvements in the products he buys, as well as the opportunity to buy a given model in a seemingly endless number of variations.

A little over two years ago, Hamilton Herman, AMF Vice President and Director of Research & Development, commented on this situation: "One of the key problems associated with the automation trend has been that changes in the end product, such as an automobile, caused obsolescence not just of a single machine, but of a complete production system. The capital investment required for a model change has increased many-fold. In many cases the cost is so high that it has led to considerable thought about 'flexible' machines that would lend themselves to automatic production systems, but be less likely to become totally obsolete at the time of a model change."

Today, the "considerable thought" mentioned by Mr. Herman has been translated into reality.

The Family of AMF Automatic Transfer Machines

A new line of production machines based on the concept of versatile automation was shown by AMF at the annual American Society of Tool and Manufacturing Engineers exhibit, April 29 to May 3, in Chicago. The AMF products attracted exceptional interest and were given wide publicity.

The new line consists of FLEXiMAN*, the name given to a series of low-cost, point-to-point, programmed transfer machines that feature rugged mechanical reliability and simplified electromechanical controls; and VERSATRAN*, a continuous-path, programmed transfer machine with exceptional payload capacity, and the program flexibility to fulfill the most demanding job specifications.

At the time of the show, Mr. Herman commented, "VERSATRAN and FLEXiMAN will open up new areas in flexible and portable automation of production. These machines reduce production costs, save on materials, achieve higher quality, and largely eliminate the cost of obsolescence associated with fixed and single-purpose automation. All of this will help companies that are feeling the continuing pressure of the profit squeeze. Together, these 'Magic Hands of AMF'

AMF PRESENTS A NEW KIND OF AUTOMATION

offer a dramatic increase in efficiency to countless manufacturing and assembly operations."

Job Versatility

The notable feature of these machines is that, on any specific job, they operate with the speed, precision, and efficiency of single-purpose machines, but when the run is over they can be quickly moved to a new location, where they can be easily re-programmed, on the spot, to an entirely new operation. In view of their flexibility, either of the new machines can be easily incorporated into an existing production system.

Although they are called transfer machines, the VERSATRAN and FLEXiMAN units are designed to carry out two different categories of operations: loading, operating, and unloading of production machines; and product assembly. In addition, VERSATRAN is designed to operate hand tools.

Production machines such as punch presses, machine tools, and conveyors can be efficiently operated by the new transfer machines. In these applications, coordination with one or more external machines is a must. These transfer machines can be programmed to operate other machines or to wait until a second machine has completed its operation. The new machines are also extremely valuable for automatic assembly, where they have the ability to carry out a repetitive sequence of operations, hour after hour, with the same speed and precision at the end of the shift as at the beginning.

As a result of its greater capacity, VERSATRAN can operate hand tools to carry out a specific function, such as drilling, nut-running, and paint spraying. In operations of this type, the manufacturer often enjoys savings in materials, in addition to other benefits.

The use of these transfer machines is, of course, particularly desirable on jobs that are unpleasant due to the uncomfortable, tedious, or dangerous nature of the operation.

Manipulators

The most dramatic feature of VERSATRAN or FLEXiMAN transfer machine operation is the combination of arm, wrist, and manipulator (gripper) motions the machine carries out on a programmed basis. Important as these motions are, the nature of the manipulator itself plays a vital part in any successful production line application.

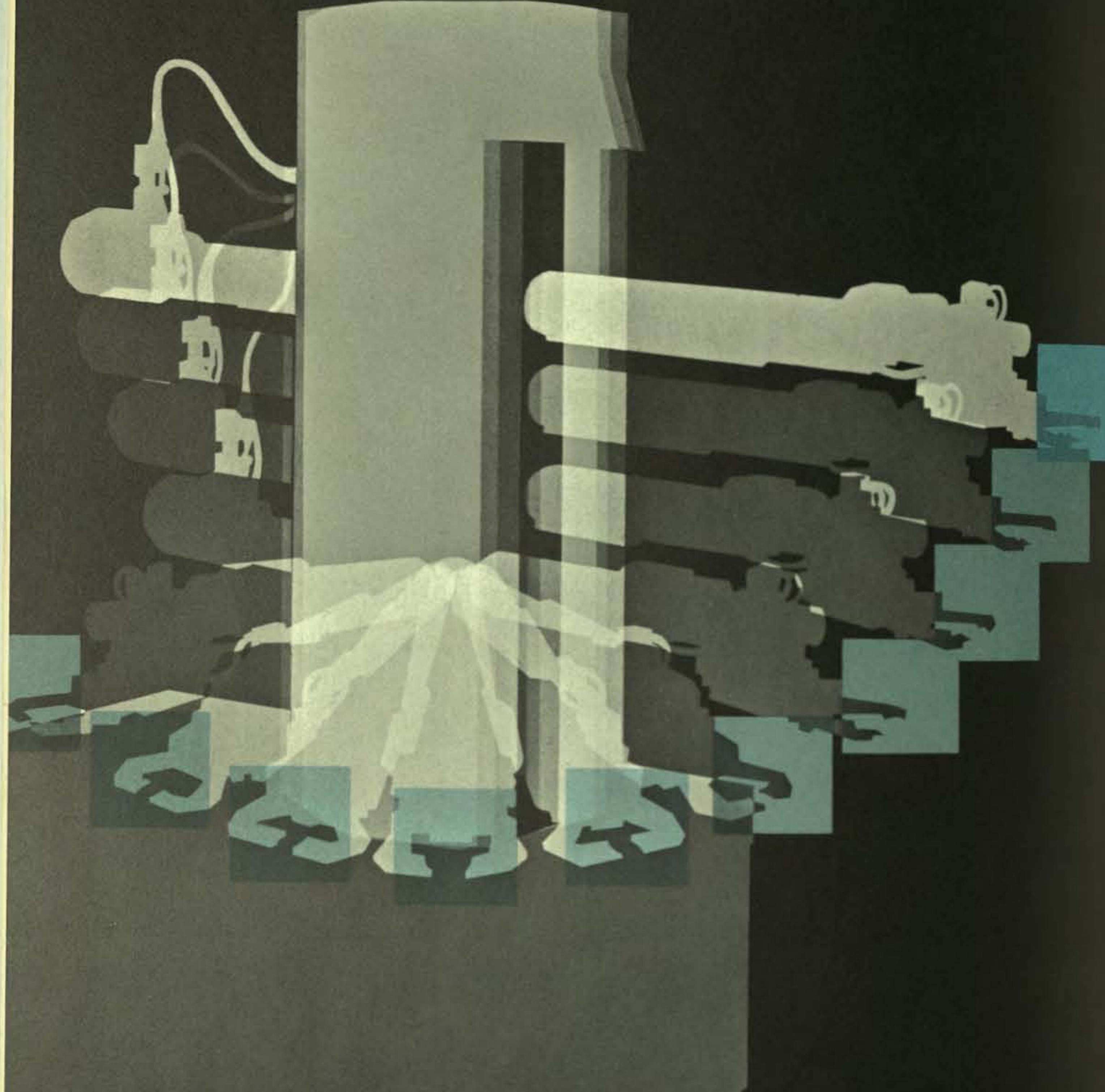
The form the manipulator takes is dictated by the nature of the job to be done. Actuation can be pneumatic, hydraulic, vacuum, or electrical. A variety of general- and special-purpose grippers is available. Often, however, the nature of the application requires the use of specially designed grippers. In these cases, AMF applications engineers, experienced in transfer machine capabilities, stand ready to provide whatever customer service engineering may be required, up to complete design and fabrication of the desired grippers.

Customer Service

In providing the new line of automatic transfer machines, with its wide range of job capabilities, AMF now can meet a full range of industrial needs. Selecting the right machine for the right job is only one part of the service AMF engineers perform. This service begins with a thorough analysis of the existing production system, and continues through transfer machine selection and installation, gripper recommendation or design, training of customer personnel, and actual production start-up.

The new transfer machines are the result of AMF's firm belief that, if automation is to remain a vigorous, healthy source of industrial growth, it must embody the idea of engineered flexibility. The enthusiastic reception VERSATRAN and FLEXiMAN have received indicates that this feeling is shared by many, throughout industry, and that these machines meet a very real need. ■

"FLEXiMAN" and "VERSATRAN" are American Machine & Foundry Company's trademarks for its automatic transfer machines.



VERSATRAN—AMF's versatile, high-payload-capacity, automatic transfer machine—meets the most exacting requirements of modern, automated systems of production, and provides industry with the ultimate in programming ease and end-use flexibility. Subjected to rigorous field tests for the last year and a half in a number of automotive and appliance manufacturing plants, VERSATRAN has proved its value and versatility on the production line—where it counts most. Offering a unique capability, VERSATRAN is the only automatic transfer machine in production to combine continuous-path control with tape-recorded electronic programming.

The major components of VERSATRAN are the transfer unit itself, and a separate electronic control console. Together, they constitute a hydraulically actuated, electronically controlled transfer machine, using a closed-loop, or feedback, system to achieve its major motions. In automatic operation, these three-dimensional, continuous-path, arm motions are initiated by tape-recorded pulses from the control console's memory system. These pulses, or signals, actuate three electromechanical control devices, called servo-valves, located on the transfer unit. The servo-valves govern the three major types of VERSATRAN motion, by allowing controlled amounts of hydraulic fluid to reach the appropriate axis drive mechanisms.

VERSATRAN

a continuous-path, automatic transfer machine with optimum program versatility and high payload capacity

Major Axes of Movement

The three major axes of movement controlled by the closed-loop, hydraulic servo-valves are horizontal, vertical, and swing. The VERSATRAN transfer arm is capable of a 30-inch horizontal movement back and forth along its axis. Vertically, the arm can be raised and lowered through a distance of 30 inches. Swing, or rotation, is accomplished as the vertical column containing the transfer arm is driven through an arc of 240°. Movement accuracy, in all three planes, is within ± 1/16 of an inch. The envelope of activity of these combined movements is illustrated by the photograph on page 7. The path traced by a light affixed to the end of the transfer arm covers a volume of more than 60 cubic feet.

Programming

To program the three axis motions, the operator sets the control console to "Program" and manually moves the arm through the desired motions. He uses an auxiliary joy stick control, attached to the main arm, to actuate the unit's power steering system.

To program the actuation of the wrist and gripper functions, the sequence of the functions is first set into the electronic console. Then, as the operator moves the arm through the desired movements, he pulls the trigger of a pistol-grip actuator to tape-record the particular wrist or gripper action at the desired point in the transfer cycle.

Fine adjustment of degree of gripper or wrist action (that is, degree of jaw open or close, or degree of wrist rotate) is by manual adjustment of setscrews on the gripper itself.

Manipulator Capabilities

Various manipulators, or grippers, are adaptable to the VERSATRAN transfer arm. Hydraulic power can be supplied for up to three types of gripper movements. If, for example, a manipulator using dual gripper fingers is used, solenoid-controlled hydraulic cylinders will close the spring-opened gripper fingers, swing the manipulator left or right in a horizontal plane, or rotate it clockwise or counter-clockwise in a simulated wrist action. The open-close finger motion is adjustable from 0° to 120°, and the left-and-right horizontal swing and rotational motions of the complete manipulator are adjustable from 0° to 180°. In less sophisticated applications, the transfer arm may carry only fork-type lifting arms; in other applications, the arm may carry a portable tool, such as an electric drill, a paint sprayer, or a pneumatic nut-runner.

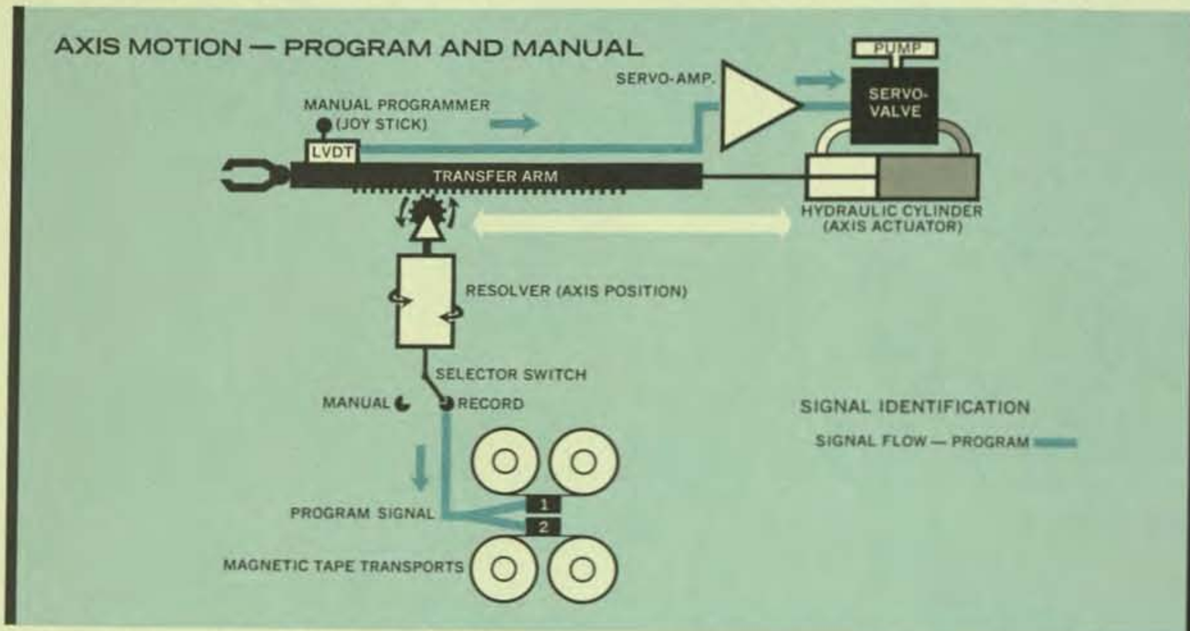
Magnetic Tape Memory and Command

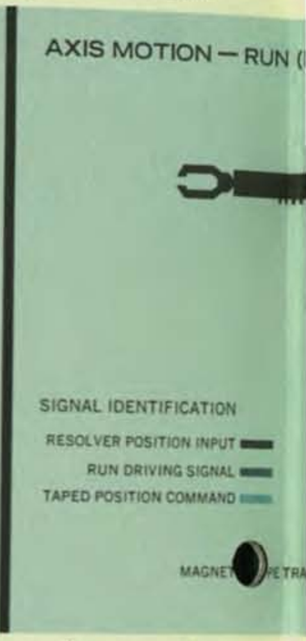
Standard, instrumentation-type, five-channel magnetic tape is the VERSATRAN memory and the source of motion command signals to the transfer machine. Three of the five tape channels are used to record axis motions, the fourth is for recording a fixed timing-reference signal, and the fifth for recording commands to auxiliary functions. Two tape transports, operating alternately, give a normal programmed production cycle of approximately six minutes. As one tape directs the motions of the transfer machine, the other tape is rewound: one tape is always ready to take over when the other completes a cycle. When the production operation calling for a particular program has been completed, the tapes can be removed from the control console and stored until the next time they are needed. Immediately, VERSATRAN is ready to be programmed for the next series of operations to be performed. *This ability to meet demands for many different sequences of transfer motions with new sets of magnetic tapes, rather than with completely new machines, is a basic advantage of the VERSATRAN approach to automation.*

Manual Control and Auxiliary Programming Aids

VERSATRAN is controlled manually whenever the operator wants to move the transfer arm, or the manipulator, from one position to another without using automatic tape control. Also, manual control is used in pre-programming to establish the best path of motion for the transfer arm, and to check gripper rotation adjustment and swing range prior to actually programming a new series of transfer motions.

Two accessory plug-in components are used in the manual and programming phases of VERSATRAN operation: the manual programmer, or joy stick; and the control handle, or pistol grip. During manual operation, and in programming, these auxiliary aids are physically and electrically connected to the transfer machine and electrically interconnected with the control console. In programming, the operator uses his right hand to grasp the joy stick programmer, which is plugged into the top surface of the transfer arm. By moving the joy stick, the operator leads the transfer device, manually, through the movement pattern to be recorded.





The pistol grip, held in the operator's left hand, controls power to the transfer device. The front of the grip contains two trigger switches. The lower switch is a "dead man" type and, during manual operation, must be depressed continuously by the operator. If pressure on the switch is released, all axis safety valves lock and machine motion stops. The upper trigger switch controls the preset commands to the gripper elements on the manipulator.

Axis Motion — Program

Movement of the manual programmer, or joy stick, in guiding the transfer arm during programming brings a series of linear variable differential transformers into action. These electrical units, commonly known as LVDT transducers, are used to detect the difference in linear position between two objects. The VERSATRAN system uses three such transducers, one for each of the three major axes of movement. The three-dimensional movements of the joy stick displace the core of each transducer relative to its case, causing the transducer to produce a voltage output in the form of a sine wave. The magnitude of this transducer voltage indicates the amount of difference in linear placement between the LVDT core and its case; the voltage phase indicates the direction of the difference. The transducer output is amplified and sent as signal voltage to the electrically actuated, hydraulic servo-valve which it controls.

As shown in the diagram of axis motion, the transducer-directed servo-valve controls the flow of hydraulic fluid to the axis actuator — in this case a double-acting cylinder. To permit smooth, continuous-path motions of the VERSATRAN arm, the servo-valves' control of oil flow to the actuating cylinder is continuously variable. The output of the piston rod is connected to the VERSATRAN arm and moves it in the same direction as the original motion of the LVDT core.

If the control system is set to "Program" during manual operation of the transfer arm, three other electrical transducers, called resolvers, are actuated. As the axis motion diagram illustrates, when the actuator moves the VERSATRAN arm, the input arm of the resolver controlling that axis of motion is also made to turn. The resolver output thus produced represents, electrically, the instantaneous position of the transfer arm. This resolver position signal, eventually converted to a train of electrical pulses, is recorded simultaneously on both magnetic tapes in the memory system. To the memory system, the instantaneous widths of these pulses represent the corresponding position of the VERSATRAN arm. In this manner, each of the three major axis motions is recorded on a separate channel of the memory tape.

Axis Motion — Run

Repeated automatic operation of VERSATRAN's three major motions is achieved by playing back the tape record of the manually programmed transfer cycle. In playback, the pre-recorded pulse train indicating the desired position of the arm serves as one input to a summing circuit, as indicated in the axis motion diagram. The second input to the summing circuit is derived from the individual axis resolvers that, during playback, serve to monitor the continuously varying positions of their respective axes.

The summing circuit compares the first input — provided by the previously recorded axis position signals on the tape memory — with the input provided by the axis resolver, representing the actual position of the axis at that moment. The difference in signal inputs causes the summing network to produce a driving signal that forces the axis actuator to follow the pre-recorded arm position signal. This means that the arm must move until the signal difference in the summing circuit is brought to zero. At that moment, the axis arm position exactly corresponds to the position programmed for it on the tape memory. This axis driving signal is proportional to the difference between where the arm *should be* (tape signal) and where the arm *is* (resolver signal).

Gripper Functions

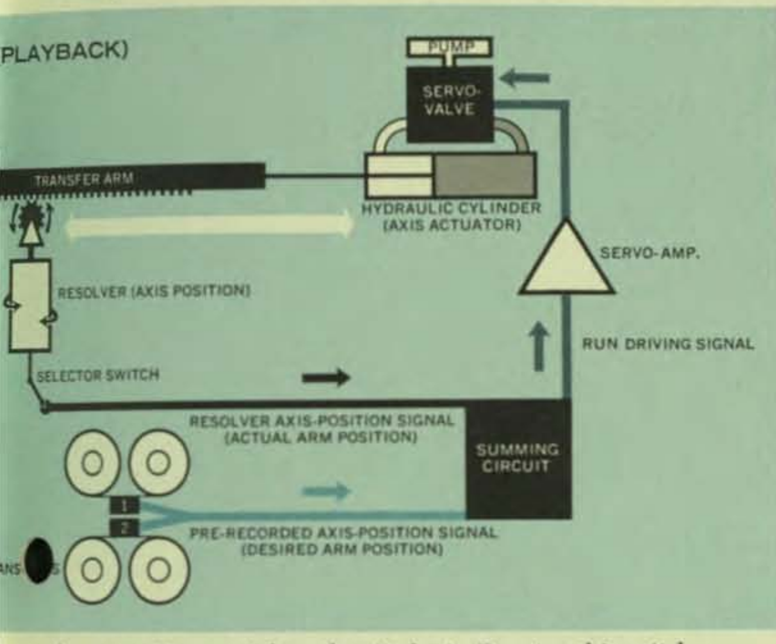
Normally, gripper motions are predetermined and adjusted before a production cycle is recorded. Eleven auxiliary function selector switches are located on the control console. These controls permit the operator to preset the gripper functions to grasp, rotate, or swing – in whatever sequence is required. In programming, the operator manually leads the transfer arm to the position where a gripper motion is needed and presses the upper trigger switch on the pistol grip. Pressing this switch allows hydraulic power to flow to the axis actuator, causes the gripper to function, records the particular gripper motion on the tape memory, and switches the auxiliary function control so that it is ready for the next command. This gripper actuation continues, under operator control, until all of the predetermined gripper motions have been accomplished and recorded on VERSATRAN's tape memory system.

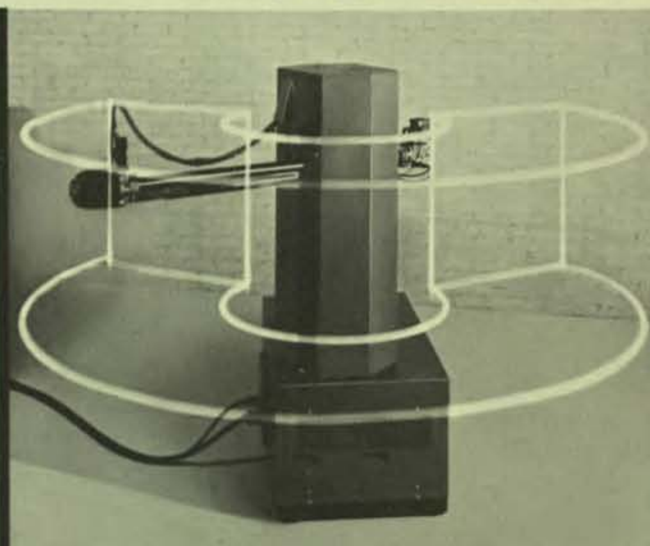
The "Home" Position

The pistol grip contains another switch essential to programming. Pressed to the left, at the start of a program cycle, this switch unlocks the system's hydraulic safety valves and permits the tapes to run. Pressed to the right, the switch causes VERSATRAN to move directly to the location that has been predetermined as the best position from which to begin the transfer cycle. Initially, the VERSATRAN arm is moved to this start location, called "home," by adjusting three potentiometers on the control console. In programming, after completing the last transfer motion of the cycle, the home switch is pressed to the right, and the arm returns automatically to the start position. Then, by pressing this same switch to the left, an "End" signal is recorded on the tape and the programming cycle is completed.

Check-Point

The auxiliary pistol grip also contains a check-point switch. During programming, this button is pushed to record a check signal at the point in the cycle where it is desired to synchronize the transfer unit to an external machine. In the program playback, the check-point signal interrogates a limit switch operated by the external machine. If the synchronization between VERSATRAN and the other machine is as it should be, the cycle continues; if it is not, VERSATRAN will stop until an "all clear" signal is received.





The path traced by a light on the end of the VERSATRAN transfer arm covers a swept volume of over 60 cubic feet. Within this envelope of activity, VERSATRAN can accomplish an infinitely variable program of continuous-path transfer motions.

VERSATRAN Specifications

VERSATRAN can move objects weighing up to 40 pounds at velocities of 36 inches per second in the horizontal and vertical planes, and at 90 degrees per second in swing. At slightly slower speeds, VERSATRAN can transfer even heavier objects. Allowing for varying complexities in transfer operations, VERSATRAN can accomplish between 250 and 1200 transfers per hour.

VERSATRAN's hydraulic system contains a 7½-HP motor capable of supplying the system's various actuators and drives with a 7½-gallon-per-minute supply of hydraulic fluid at a pressure of 1000 psi. Safety features include locking valves to prevent arm motion in case of power failure or excessive positional error. Machine operation is fail-safe: the transfer arm cannot drop or swing due to power failures.

The control console weighs 400 pounds and occupies 4 square feet of floor space; the transfer unit itself weighs 1300 pounds and requires approximately 8 square feet of floor space. Power requirements are: 115 volts AC, 20 amps, single-phase, 60 cycle for the console; and 440 volts AC, 20 amps, three-phase, 60 cycle for the transfer unit.

In addition to providing the continuous-path motions essential to many types of transfer cycles – and other production operations requiring the faithful reproduction of functional arm movements – VERSATRAN offers high payload capacity, transfer speed, ample hydraulic power, and compact design. In VERSATRAN, AMF offers industry a new kind of production tool . . . one with built-in resistance to obsolescence. Changes in product or process obsolete only the tape, not the machine itself. ■


FLEXIMAN

FLEXiMAN

an entirely new approach to three-dimensional positioning . . . features rugged simplicity, low cost, and practical versatility

BY DEFINITION, an automatic transfer machine must be capable of grasping an object at any point in a defined three-dimensional space and transferring the object to any other point in the defined space, repeating the sequence as long as desired. Within this broad definition, industrial needs cover an immense range. Many applications require a machine embodying the ultimate in program flexibility, capacity, and reach. For such applications, AMF's VERSATRAN is the only answer. Another major area of applications, however, can be easily satisfied with a machine having more limited capabilities. Specifically designed to meet this second group of needs is the FLEXiMAN series of low-cost transfer machines.

In selecting the design objectives for FLEXiMAN, primary attention was placed on achieving those characteristics that would satisfy the maximum number of job requirements and, at the same time, permit the unit to remain a basically simple, electromechanical machine.

A Point in Space

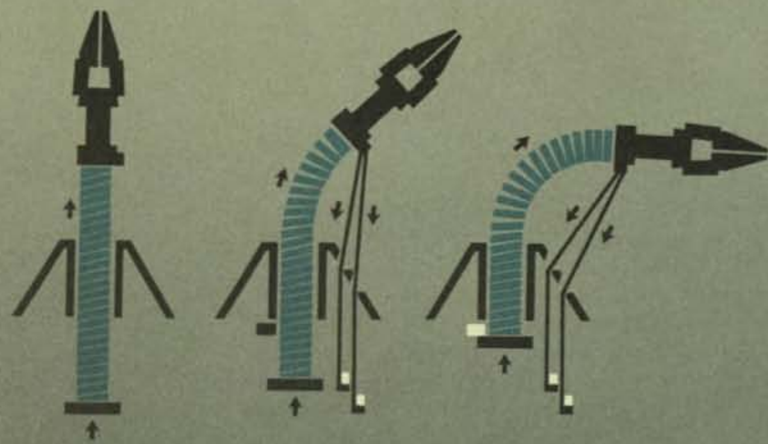
Central to the creation of an automatic transfer machine is the means of achieving three-dimensional positioning. FLEXiMAN's positioning method was not achieved by simplifying existing sophisticated positioning techniques. Instead, FLEXiMAN uses an entirely new, unique, method . . . one ideally suited to a wide range of applications.

The basis of FLEXiMAN's three-dimensional positioning is the controlled bending or deflection of a heavy-duty spring, which serves as the transfer arm. In retracted position, inside the case, the spring is vertical. To reach a desired location, the main motor drive pushes the spring vertically upward. If it were not acted upon, the spring would continue in a vertical direction; however, the spring is constrained by two "tendon" cables that run between the outer end of the spring and positions that are offset from the centerline of the spring. Depending upon the length of these tendons, the spring can be allowed to continue in a vertical direction, or, with both tendons shortened, the spring will be bent down and to the side.

This action has been likened to reining a horse, guying a tree, or stringing a bow. Shortening the reins, guy-ropes, or bow string causes a bending that, in the case of FLEXiMAN's tendons, is put to good use in defining a point in space.

The distance the spring is allowed to extend from the case, and the effective lengths of the restraining tendons, are sufficient to completely define a point in three-dimensional space. Once these values are established for a particular point, a simple mechanical programming method permits the end of

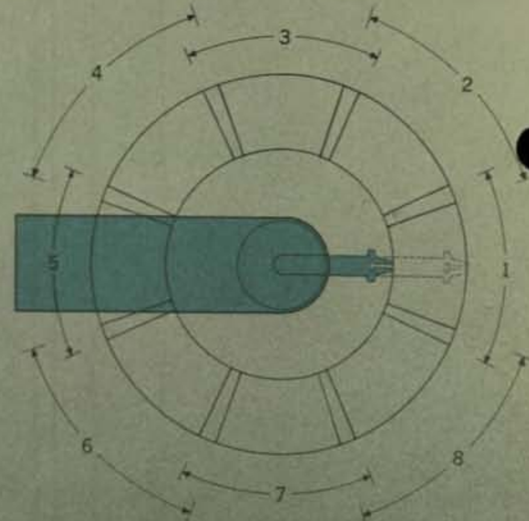
The Principle • FLEXiMAN's unique method of three-dimensional positioning is based on the use of a single motor drive and the controlled bending or deflection of a heavy-duty spring.



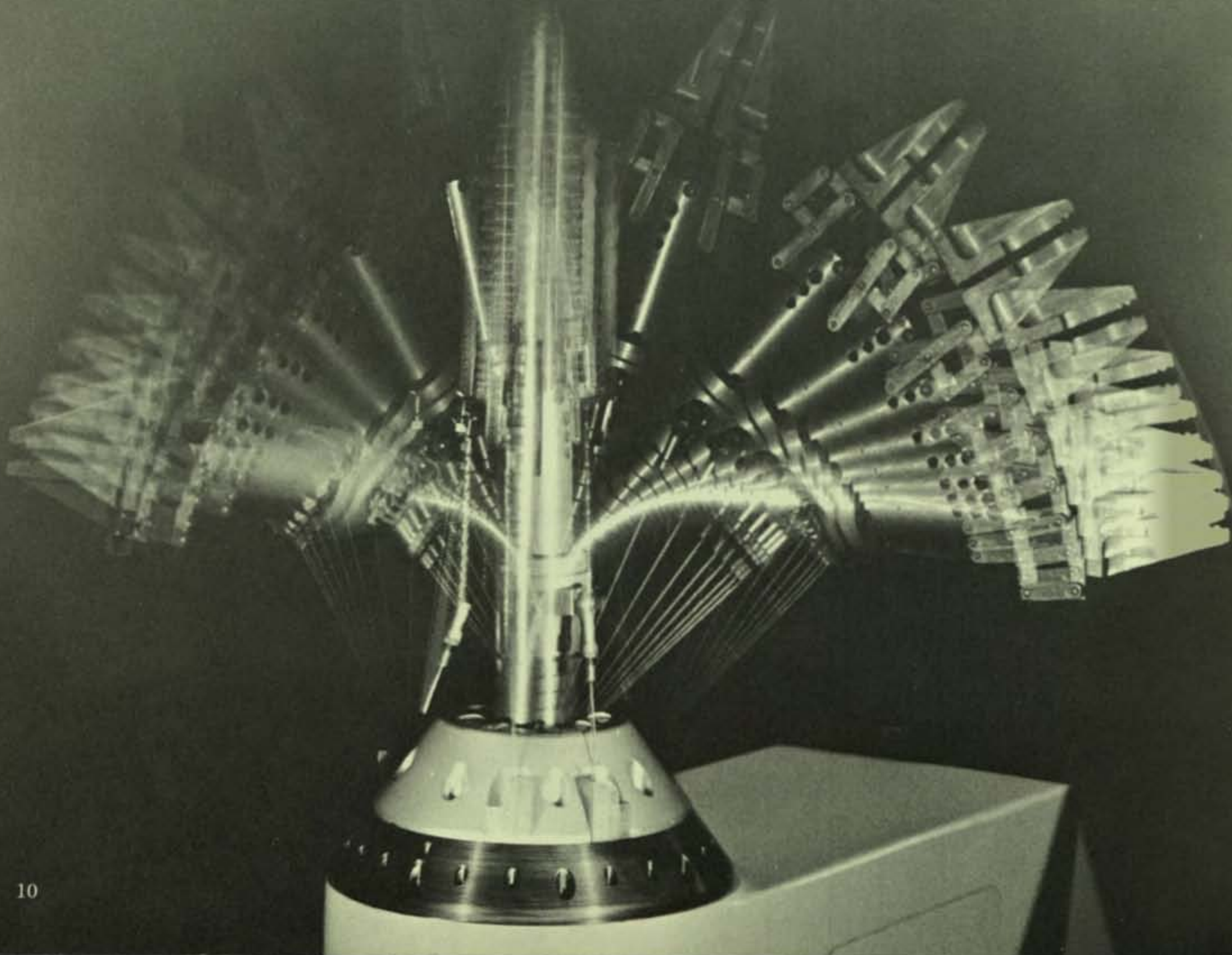
Spring (main arm) advances without restriction

Spring advances but vertical movement is restricted by tendon stops

Final position reached when spring advance is restricted by stop



Zone Concept • FLEXiMAN's hemisphere-shaped range is divided into 8 zones, each of which overlaps adjacent zones. Programming and control is based on the selection of one work location per zone. Exact work location, gripper hand attitude, gripper hand action, and interlocking functions are programmed independently for each of the work zones involved in a program.



the spring, with its appropriate gripper attachment, to return to the precise spot originally defined.

Work Zone Concept Gives Practical Versatility

FLEXiMAN programming and control is based on the division of the 360-degree hemispherical work volume into eight equal segments or zones. The user can select one end-point (work location) in each of the zones. Each of the motions and functions in a program is associated with a particular zone, and is carried out as soon as the arm reaches that zone.

With both tendons set at the same length, the end of the arm would be able to reach points lying along a single arc in each of the work zones. Lengthening or shortening both tendons changes the curve of the arc, but still the motion remains in one plane. Shortening one tendon with respect to the other deflects the arm laterally, and permits it to describe an infinite number of arcs throughout a given work zone. The lateral scope of the arm in each of the work zones is 55°, allowing a generous overlap with adjacent work zones.

Operation

When FLEXiMAN moves an object from one location to another, it performs a series of reach and retract motions. For example, in the simplest type of transfer operation, FLEXiMAN starts in the retract position, reaches out to the first work location, grasps the object, retracts, rotates to a new work zone, reaches out to the new work location, releases the object, retracts, and finally, rotates in a counter-clockwise direction to the original work zone and repeats the cycle.

For a simple transfer operation, only two zones might be required, with the sequence going from zone 3 to 7 to 3 to 7 to 3 etc. A complete program can consist of up to 16 steps, involving any sequence of two or more zones. In a complex machining or assembly operation, the sequence might be from zone 1 to 2 to 4 to 6 to 8 to 1 to 2 to 4 to 6 to 8 etc.

Interlocking

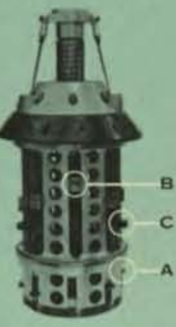
Coordination of all the elements in a production system is a key requirement of efficiency. Interlocking of FLEXiMAN with other units is carried out by means of an 8 x 6 pin board. The eight horizontal rows correspond to the eight work zones. The six vertical columns correspond to standard functions. Inserting appropriate pins causes FLEXiMAN to wait for a set time period before entering a work zone; to hold, arm extended, for a set time period; to wait for an external signal before entering a work zone; to hold, arm extended, until an external signal is received; or to start or stop a second machine.

Programming

Although a FLEXiMAN program may consist of up to 16 steps, and involve such complexities as interlocking with external machines, as well as wrist and gripper actions at each of the steps, FLEXiMAN programming is a remarkably simple, straightforward, and reliable operation. No special skills are required.

The most basic programming step is establishing the zone sequence. This is done simply by inserting sequence cams on a memory drum located on the main frame. Next, the operator moves the unit through the desired sequence of zones. At each zone, he makes independent adjustments for each of the functions to be performed at that zone location.

To program the precise work location, the operator adjusts three mechanical stops to establish tendon length and arm extension.



Memory Drum • The heart of FLEXiMAN's control system is a memory drum, which rotates about the main arm. Work zone sequence is established through the use of appropriate cams that engage permanent stops (A) on the surface of the drum. The drum also has eight arm extension stops (B), one for each zone. Tendon length in each zone is established when tendon lugs (C), which slide vertically on guides, are arrested by tendon stops located on the main frame.

Some applications require a degree of control of the gripper hand attitude that can only be achieved by rotating or deflecting the wrist. A special optional accessory having this capability is available and can be programmed simply by releasing two locking screws, manually setting the hand in the desired attitude, and re-setting the screws.

The action of the gripper hand is programmed for each of the work zones by means of switches located on the control panel. Once set, these switches cause the gripper hand to grasp, hold, or release a part being handled after FLEXiMAN has reached the programmed work location.

Should interlocking with external machines be involved, the operator merely sets the appropriate interlocking function into the pin board.

Four FLEXiMAN Models

FLEXiMAN is offered in four models to satisfy a wide variety of work range and capacity requirements. Because the models are functionally identical, they provide the needed capabilities at the lowest possible cost. The models 1000, 1400, 2100, and 3600 have nominal capacities ranging from 1.5 pounds for model 1000 to 25 pounds for model 3600. Reach ranges from 10 inches for model 1000 to 36 inches for model 3600.

The model 1400 FLEXiMAN is expected to be particularly popular. This unit has a capacity of 3.5 pounds, and a reach of 14 inches. It operates at a rate of 20 cycles per minute, with a repeatability of ± .015 inch. Weighing 150 pounds, it requires a floor area of only 9 by 27 inches.

The main drive for FLEXiMAN is a variable-speed DC shunt motor. This drive provides for high-speed movement (up to 24 inches per second) and controlled deceleration, permitting the gripper to ease a part into position.

The electrical control package is ordinarily supplied in the stand used to position FLEXiMAN at the normal working height. However, where the customer intends to place the working unit on an existing surface, or wishes to have the electrical controls at a distance from the working unit itself, the control section can be supplied separately.

The Accomplishment

Exciting technological achievements frequently involve the application of the most sophisticated resources of modern science. FLEXiMAN, on the other hand, gains the status of a real break-through by being an outstanding example of the application of familiar electromechanical methods, in a new and original way, to meet a need characterized by stringent technical and economic requirements. ■

REVIEW OF PROFESSIONAL ACTIVITIES

Daniel M. Kabak, Electrical Engineer, Mechanical Development Laboratory, was a judge at the Westchester County Science and Engineering Fair, held March 20. He participated as a member of the Westchester County section of the New York Society of Professional Engineers.

Kenneth C. Hayes, Manager, Technical Services, has been elected to the Citizens Advisory Council of the Norwalk Community College. He was also a member of the Exhibitors' Advisory Committee at the 1963 Stamford Research & Industry Exposition held May 8 to 11 at the Stamford Armory under the auspices of the Stamford Chamber of Commerce. The Morehead Patterson Research Center was an exhibitor.

Eugene E. O'Brien, Safety Engineer, gave a series of eight lectures on AMF's safety program to a group of Safety Consultants from the State of Connecticut Labor Department. The series began April 4 and ended on April 22.

Raymond H. Van Wagener, Assistant Manager, Mechanical Development Laboratory, served as chairman of *The Design of Special Application Machines* session of the Design Engineering Conference held in New York, May 20 to 23.

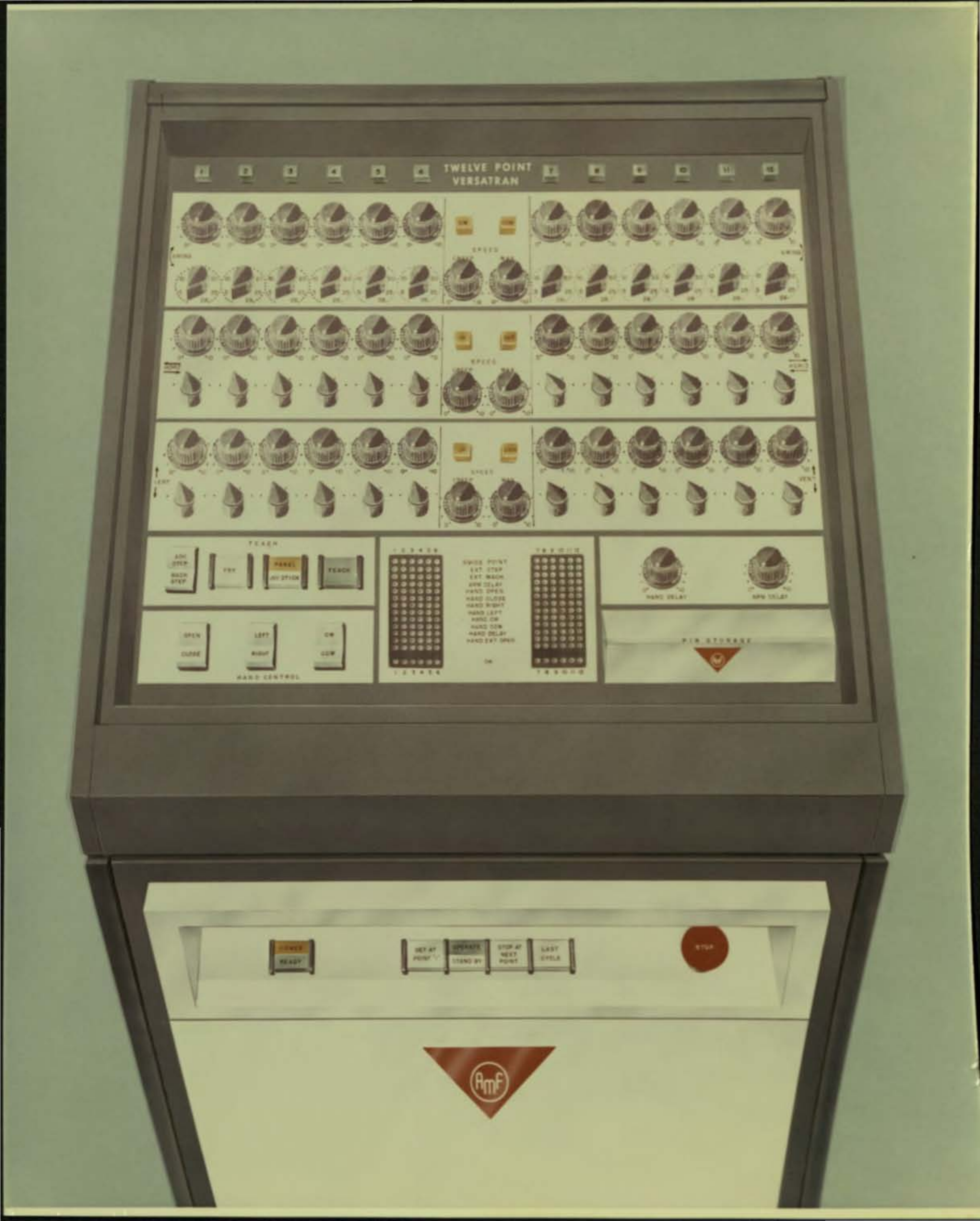
Gunther Marx, Manager, Technical and Management Communications, has been elected to the national board of directors of the Society of Technical Writers and Publishers. He served as program chairman at the Society's tenth annual convention held in Boston, May 15 to 18.

Edward Speyer, Senior Physicist, Research Department, gave a talk entitled *Here and There in Solar Energy* at the May 22 meeting of the Southwestern Connecticut section of the Optical Society of America.

Dr. Hans P. Panzer, Senior Chemist, Research Department, presented a paper entitled *Esterification of Amylose by Cation Exchange Resin Catalysis* at the national meeting of the American Chemical Society held in Los Angeles, March 31 to April 5.

Dr. Joseph C. J. Cheng, Senior Research Engineer, **Dr. Milton B. Hollander,** Research Manager, and **Dr. Joseph C. Wyman,** Research Metallurgist, all of the Mechanics Research Group, Research Department, co-authored a paper entitled *Friction Welding Parameter Analysis,* presented at the annual spring meeting of the American Welding Society in Philadelphia on April 26. Dr. Cheng also authored a paper entitled *Transient Temperature Distribution During Friction Welding of Two Dissimilar Materials in Tubular Form,* published in the May issue of the Welding Journal research supplement, and gave a talk on friction welding at the Norwalk State Technical Institute on May 28.

Dr. Herbert I. Fusfeld, Director of Research, Research & Development Division, has been elected to the board of directors, Industrial Reactor Laboratories, Inc. Designed and built by AMF, IRL is one of the world's largest reactor facilities for industrial research, and is the only one cooperatively owned by a group of private companies.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