The Agricultural Engineering 50

Outstanding innovations in product or systems technology during 1986-87

Saluting the AE 50

Acceptance in the marketplace is the highest accolade any new agricultural product can ever receive. But for innovative developments introduced in the last 12 months, a singular honor is to be named one of The Agricultural Engineering 50 outstanding innovations in product or systems technology.

Showcased over the next 31 pages are 50 top engineering developments in agriculture introduced since mid-1986. Virtually all companies making products for food and agriculture were eligible to submit for consideration "developments that embody the application of new technology or the innovative application of an older technology."

Hundreds of "product nominations" vied for coveted spots among The AE 50. A distinguished panel of engineering experts from several well-known organizations reviewed entries to select those considered most likely to make "worthwhile contributions to the advancement of engineering in agriculture."

Agricultural Engineering magazine is proud to play an important part in making known these significant developments in the production, processing, research, storage, packaging, and transportation of agricultural products. To all firms — and especially to you honorees — here is our AE 50 Salute for 1986-1987.

Amiad U.S.A. Inc.
Automatic back-flushing irrigation filters

Applied Instrumentation
Moisture sensing system for cotton modules

Applied Instrumentation
Bin-mounted grain moisture meters

ARAX International Corp.
Portable multi-sensor meteorological station

Baker Electronic Enterprises Inc.
Modular electronic seed/flow-rate monitor

Big Bud Manufacturing Inc.
Oscillation-reducing geometry in 4WD tractors

Campbell Scientific Inc.
Programmable device logs environmental data

Case IH (Tenneco Co.)
Hoe-type pneumatic grain drill

Case IH (Tenneco Co.)
Electronic system monitors pull-type combines

Caterpillar Inc.
Friction-driven rubber traction belts

Claas of America Inc.
Non-stop discharge of big round hay bales

Claas of America Inc.
Slope-compensating sieves in combines

D & W Industries (Sprafoil Div.)
Airfoil-type heads for crop sprayers

Dairy Equipment Co.
Div. of DEC International
Milking claw induces spiral flow pattern

John Deere Des Moines Works
Cotton stripper with on-board cleaner

Delmhorst Instrument Co.
Bale sensor gives continuous moisture readings

Eaton Corp. (Controls Div.)
Volumetric sampler detects grain moisture

EFSON Inc.
Spring device maintains chain/belt tension

Entek Inc.
Buried porous tubing emits irrigation water

Everest Interscience Inc.
Temp-compensated infrared sensors for crops

Farmi Electronics Corp.
Grain sensing and aeration control system

Ford New Holland Inc.
Density control for large rectangular baler

Gehl Co.
Front-mounted pickup merges forage windrows

Griswold Controls
Flow controls equalize irrigation distribution

In-Situ Inc.
Instrument monitors surface & ground water

In-Situ Inc.
Field probe for specific conductivity

Irrigation Systems Co.
of Western Colorado
Turbine removes trash from irrigation ditches

J-Star Industries Inc.
Pneu sys controls multiple daily cow feedings

Levy Systems
Refrigeration monitoring and control system

Ezra C. Lundahl Inc.
Serrated auger cuts and windrows forage

Mazzei Injector Corp.
Avanti Div.
Programmable chemical injection controller

Morris Rod-Weeder Co. Ltd.
Wheel/cup meter for air-type seeder

Motorola Inc.
Radio sends digitized voice-alarm messages

Osborne Industries Inc.
Variable-speed fan control for structures

Pertech Inc.
Computerized aeration control for stored grain

Pioneer Technology Inc.
Electromagnetic sensors count seeds in planters

Rimik Pty. Ltd.
Microprocessor acquires cone penetrometer data

Rogers Engineering Inc.
Folding mechanism for shrouded sprayer booms

SBM Infrared Heating Inc.
Zone-type infrared heaters for pig nurseries

Soil Measurement Systems
Data-recording device for tensiometers

Soilmoisture Equipment Corp.
Device measures 3D water movement in soil

Standard Oil Engineered Materials Co.
Microprocessor-based plant stress monitor

TRW Ross Gear Div.
Small roller-vane hydraulic motors

Telatemp Corp.
Data-logging sys tracks crop water stress

Trickle Soak Systems
Chemical injector tank for irrigation lines

United Farm Tools Inc.
Tri-State Div.
Side-dumping cart transports cotton

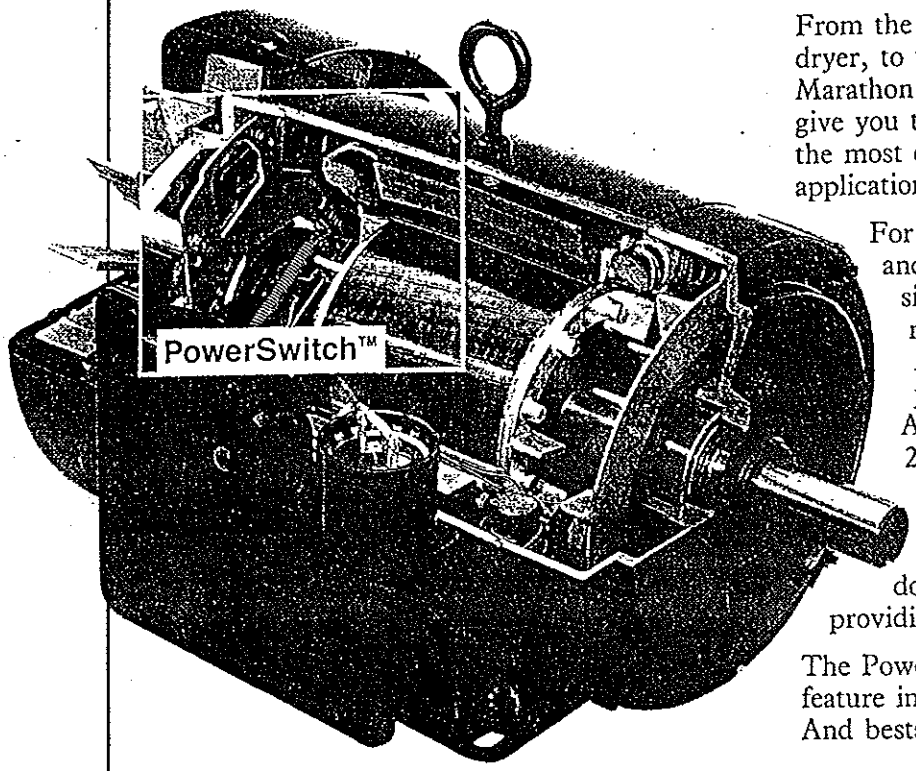
Viatran Corp.
Flush diaphragm actuates pressure sensor

Virotek Inc.
Environmental control senses air movement

Walterscheid Inc.
Adjustable friction-type driveline clutches

Weasler Engineering Inc.
50-deg constant velocity universal joint

Best in the field.



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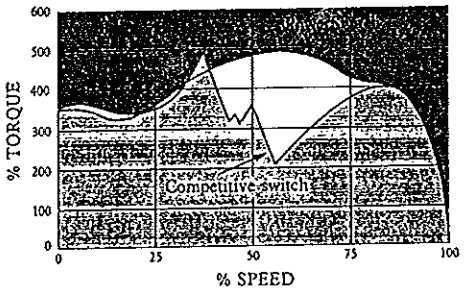

Marathon's PowerSwitch™ and competitive switch start the motor properly, but approximately 25% of the competitive motor's accelerating power (light blue area) is lost due to slow switching speed.

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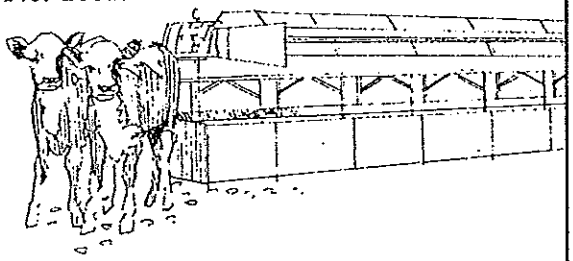
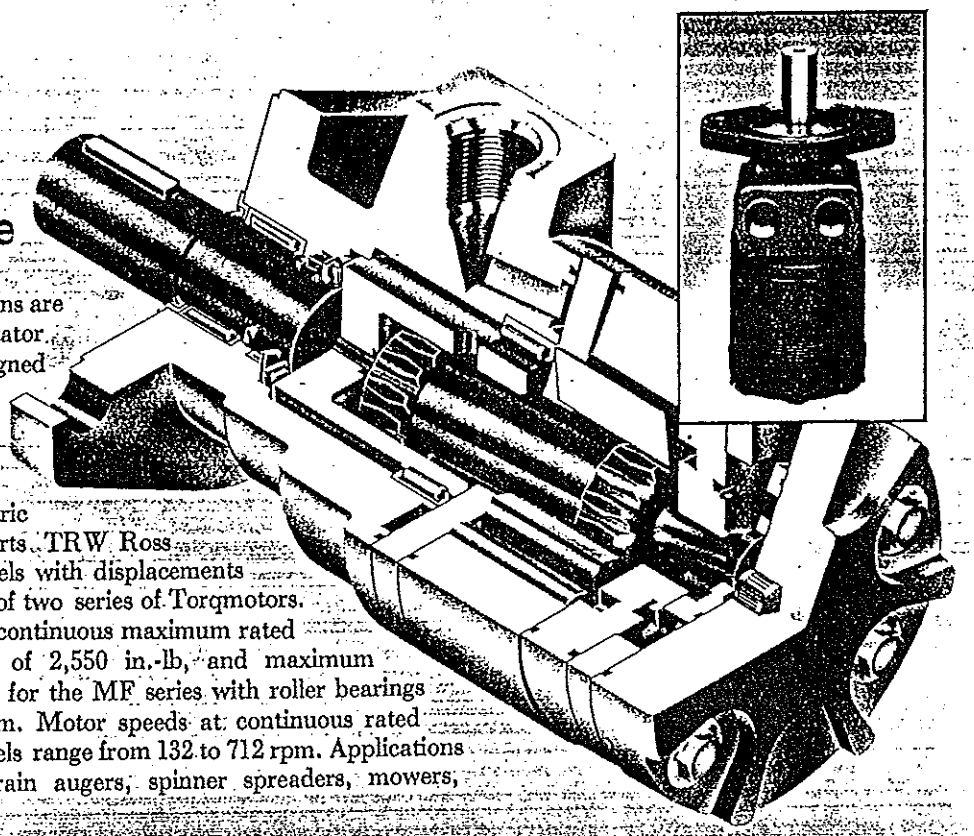


MARATHON® ELECTRIC

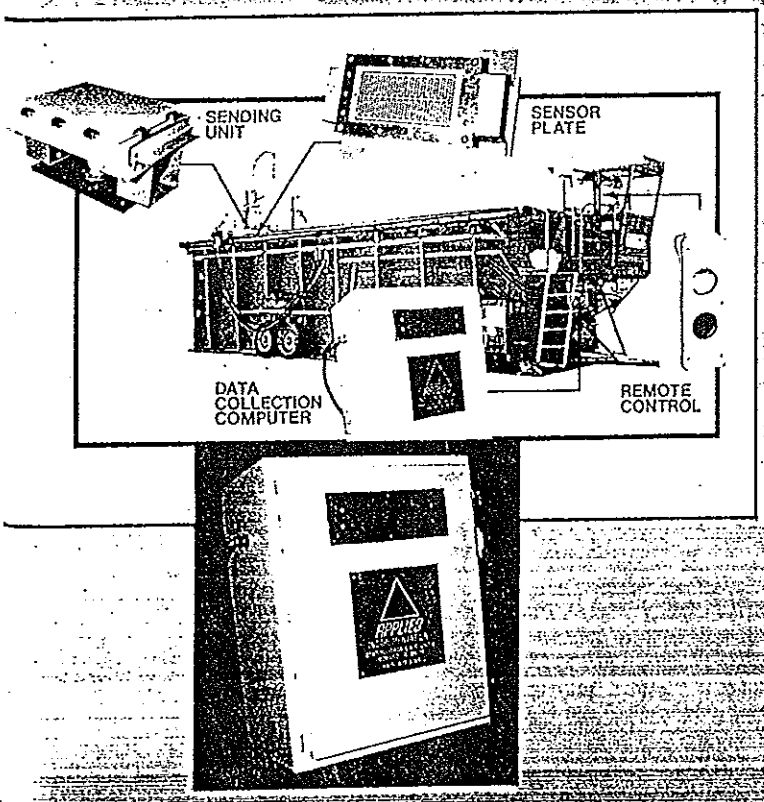
RUNS. AND RUNS. AND RUNS.

Small Hydraulic Motor Curbs Internal Leakage



Cross-port flows and case-drain provisions are eliminated in the orbit-type commutator section of small hydraulic motors designed for high-torque, low-speed operation. The internal valving and sealing arrangements for zero-leak commutation enable the roller-vane type motors to function at 90% volumetric and 85% mechanical efficiencies, reports TRW Ross Gear Div., Lafayette, IN. Twelve models with displacements from 2.5 to 20 in.^{3}/rev are built in each of two series of Torqmotors. The bushing-equipped MG series has a continuous maximum rated pressure of 1,500 psi, continuous torque of 2,550 in.-lb, and maximum flow of 15 gpm. Corresponding values for the MF series with roller bearings are 1,750 psi, 2,608 in.-lb, and 20 gpm. Motor speeds at continuous rated pressure and flow for the various models range from 132 to 712 rpm. Applications for the new hydraulic motors include grain augers, spinner spreaders, mowers, combine reels, and irrigation equipment.

Tramper-Mounted Sensors Track Cotton Moisture



A four-part system takes 300 to 500 moisture readings of seed cotton as it is being packed into a module builder. In recording the average and maximum moisture contents for each module, the system helps to reduce storage damage and schedule ginning times. Heart of the system is a microprocessor-based instrument (sending unit) that continuously monitors the signals from two sensors in a plate mounted on the machine's tramper foot. A two-electrode array on the face of the plate detects the electrical properties of cotton. The other sensor measures the compressional force applied to the cotton by a hydraulic ram. A moisture reading is triggered when the pressure reaches a preset level during each ram stroke, thereby ensuring that all measurements are made at a consistent bulk density. All readings are sent to a data-collection computer located beneath the operator's cab. This unit stores the data, computes the average and maximum values, and displays the results. Information stored in a non-volatile memory includes the date, time, module number, and moisture contents for all modules built during a season. These particulars can also be transferred to a personal computer for further processing. A remote control in the operator's cab has an indicator light and an on/off switch for controlling the Module Meter. Applied Instrumentation, Concord, CA.

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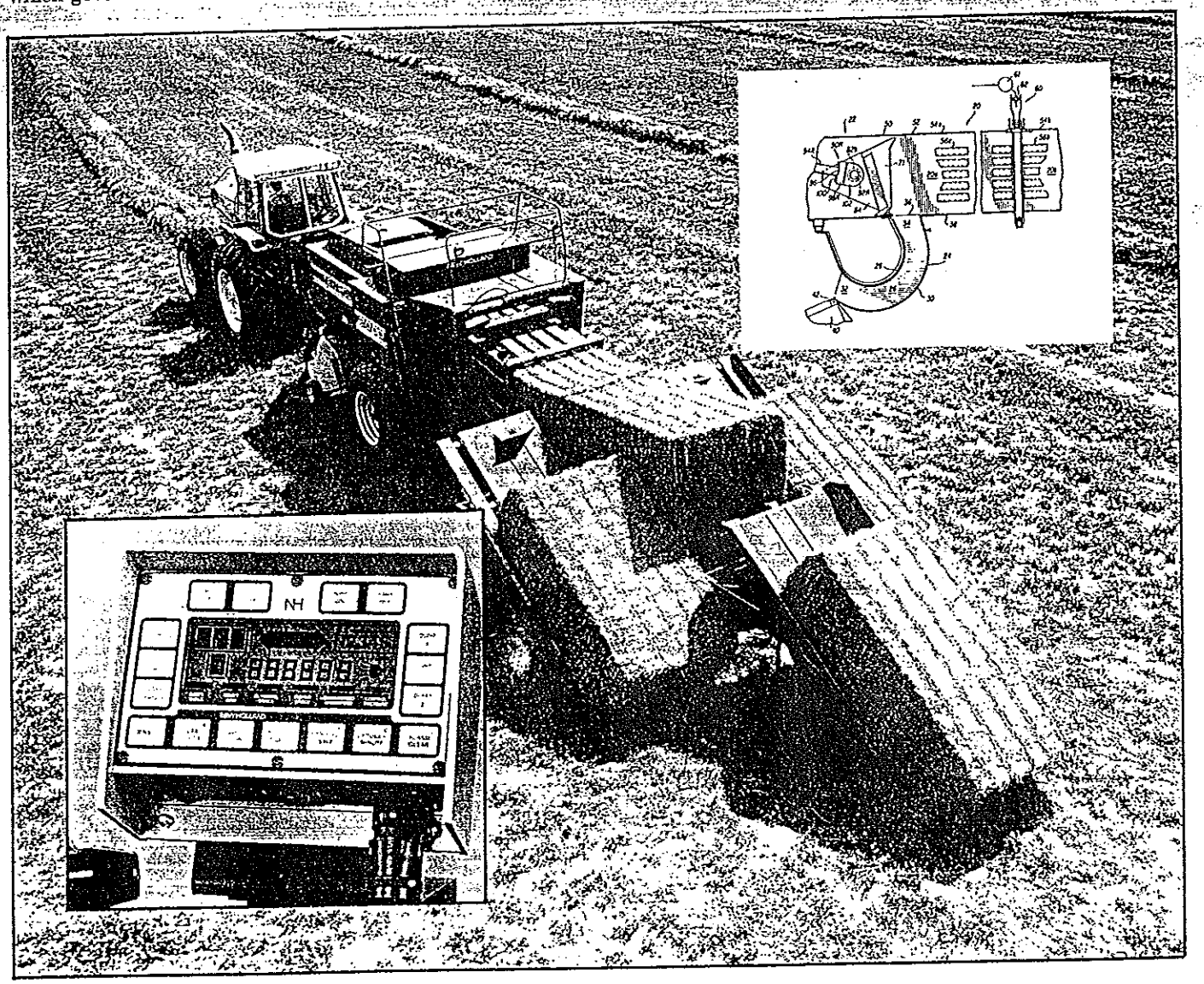
Plunger Forces Govern Density Feedback Control

Plunger-mounted load cells and signal-processing algorithms are the key developments in a closed-loop control system for adjusting bale density according to variations in crop type and moisture. The hay-compacting forces exerted by the plunger in a 46.5-in. wide, 35.5-in. high bale chamber are sensed by load cells positioned on each of two connecting rods that drive the plunger.

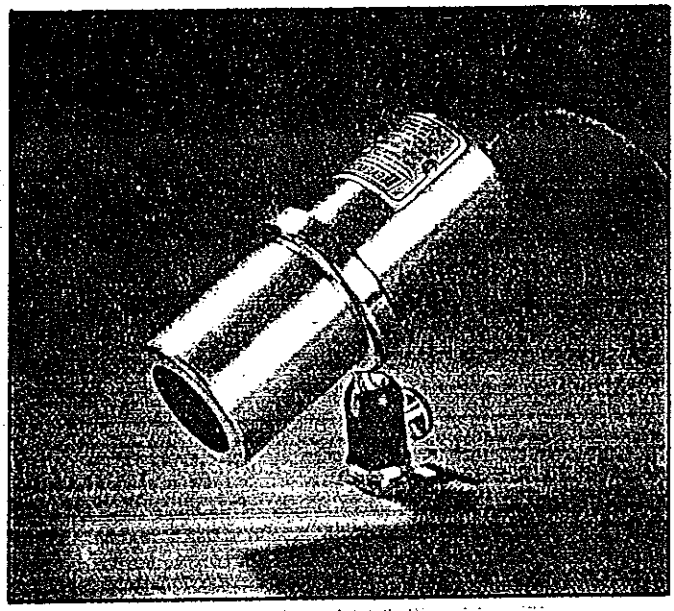
Sensor-generated signals are fed to a microprocessor installed in the baler's right-side twine box. This device analyzes the data according to several programmed routines and accepts density setpoints from a control console located in the tractor cab. The comparisons of reference and load values eventually result in a control signal going to a servo valve, which governs the flow of fluid to a hydraulic cylinder.

In retracting or extending, the cylinder actuates pivot-mounted links that change the pressure applied to top and side tension rails along the bale chamber. This process regulates crop flow through the chamber to keep plunger forces at a level giving the desired bale density.

Signal waveforms developed to control density also provide a basis for determining the PTO speed, crop inflow, bale length, and bale shape. The latter information — derived from force readings of the plunger's left and right load cells — is translated into left-vs-right clues for driving along a windrow. Altogether, over 15 functions are orchestrated by the Bale Command control and monitoring system on the model 2000 large rectangular baler built by Ford New Holland Inc., New Holland, PA.

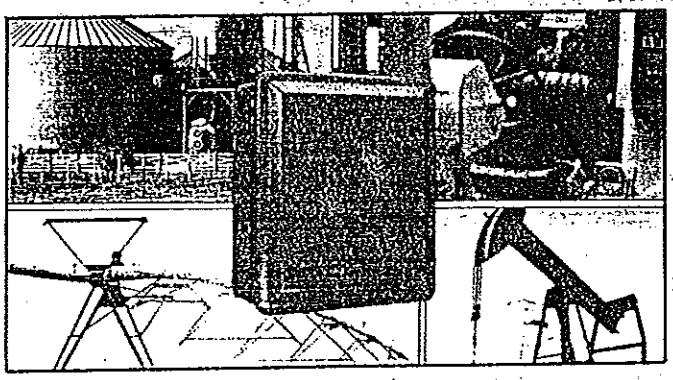


Infrared Sensors Check Crop Status



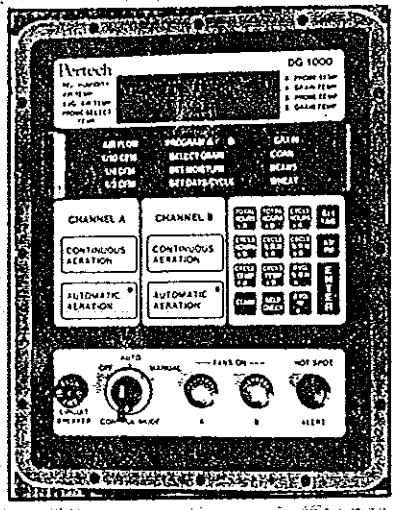
Industrial electronic devices adapted for natural environments in agriculture sometimes fail to give the desired precision and stability. One example involves the infrared temeperature transducers previously used to obtain non-contact measurements for irrigation scheduling, reports Everest Interscience Inc., Fullerton, CA. The firm has added both temperature compensation and chopper stabilization to its model 4000.2 transducer, which provides a 0.1°F resolution in less than 1 s when covering a temperature range of 14 to 120°F and operating distance of 1 in. to 1,000 ft. The 3.5-in. long by 1.9-in. diam sensing head is sealed from dust and water for use in real-time irrigation feedback control, continuous monitoring of crop canopy temperatures, closed-loop control of vegetation temperatures in greenhouses, and early warning systems for plant disease detection. In addition, up to eight transducers can be connected to a multiplexer built by Everest Interscience for multi-point temperature sensing.

Fault-Finding Radio Sends Verbal Alerts



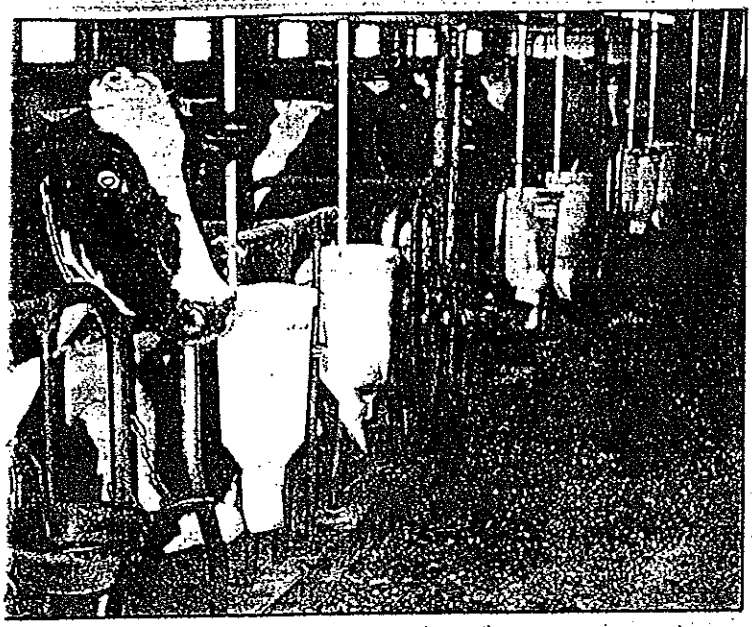
Conventional alarms provide only a general indication that something is amiss in remote equipment. In contrast, synthesized voice messages sent via two-way radio can tell exactly what is wrong with unattended machines, structures, and processes. The words or phrases comprising each alarm message are stored on a logic board housed in an on-site station. When triggered by input from up to four sensors, the alarm circuitry teams with a built-in tranceiver to send the proper message sequence. The reporting unit then delivers the alarm notification to a low-cost radio pager, portable, mobile, or base station. Incoming messages are preceded by a tone alert and call sign. A user can program the unit to repeat messages up to four times per 30 or 90-min interval. Even the status message can be programmed to include words such as "alarm, engine, fan, intrusion, leakage, level, movement, position, pump, pressure, and temperature." This digitized speech vocabulary helps the user distinguish one condition from another when several different conditions are being monitored with one station. The Radius Voice Reporter Radio is made by Motorola, Inc., Schaumburg, IL.

Aeration Controller 'Cools' Stored Grain

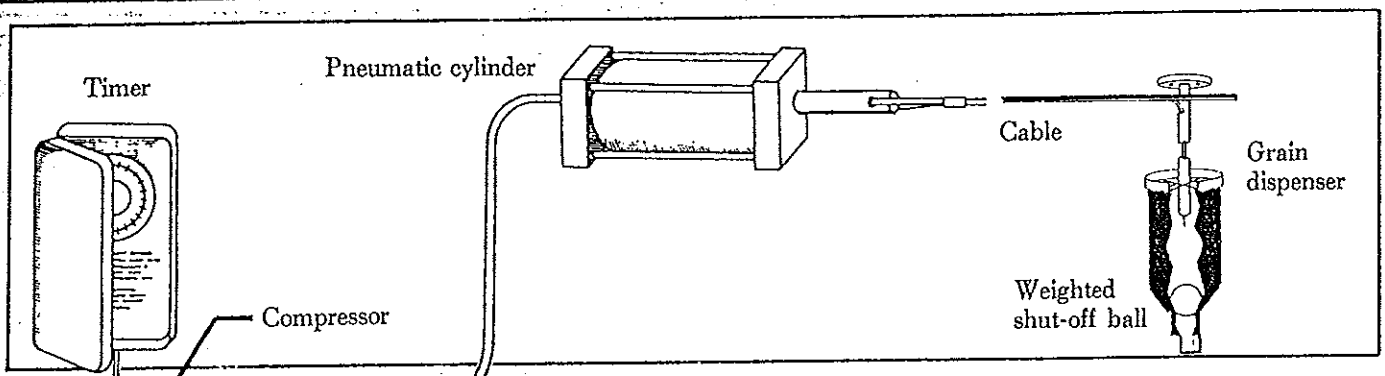


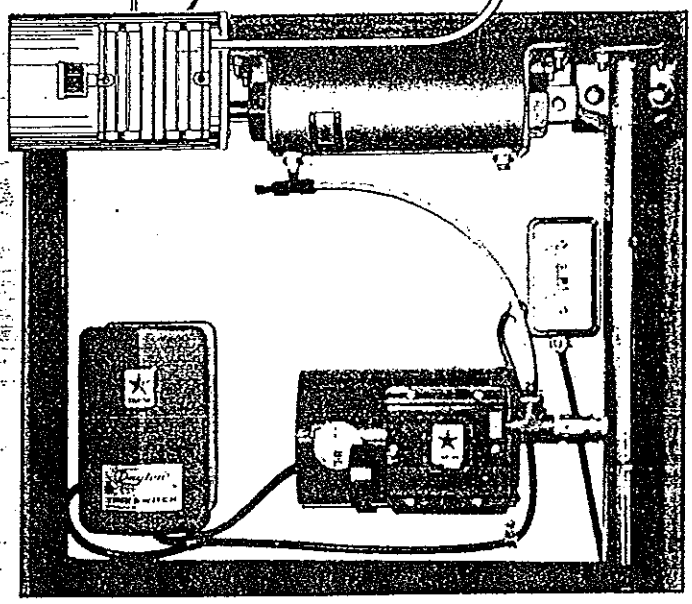
Programmable controller for the aeration of stored grain can monitor conditions in up to 12 bins and provide airflows ranging from 0.1 to 0.5 cfm/bu. Designed for large-scale operations, the Digigrain 1000 control is teamed with probes and other sensors to keep tabs on grain temperature, relative humidity, air temperature, and various calculated factors. The unit can be programmed to maintain a pre-set moisture content in stored grain, issue warnings about potential hot-spot formation, and aerate two different types of grain in multiple-bin systems. The developer of Digigrain also offers a SMARTS software package for use with IBM and compatible personal computers. This overall system enables a computer to get information from up to 15 aeration controllers, generate spreadsheet data for operating conditions and costs, and present graphic displays of aeration fronts in different storage structures. Pertech Inc., Trimont, MN.

Pneumatic Devices Control Alternate Cow Feedings



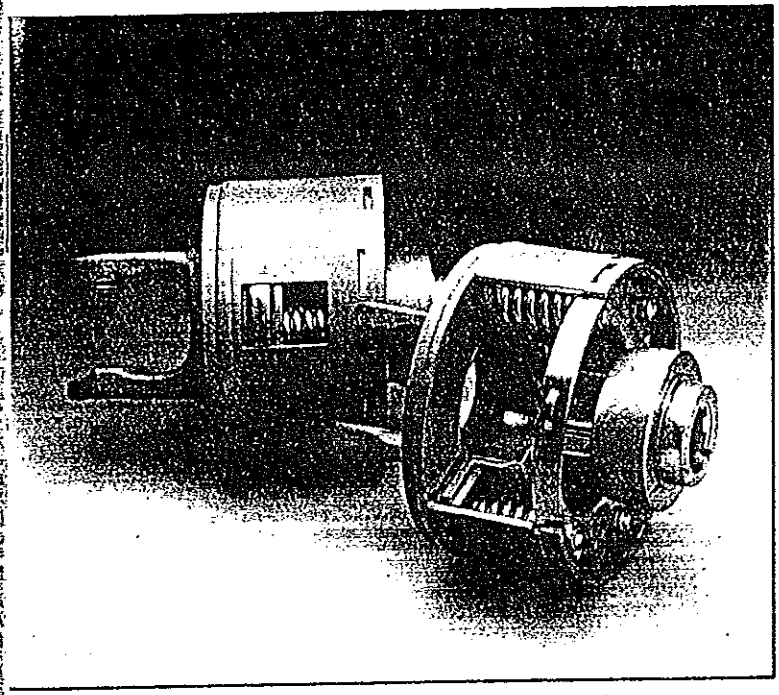
Research in dairy nutrition indicates that cows produce more milk when fed smaller portions at more frequent intervals. But a change from two or three to four or six feedings per day can substantially boost a dairyman's labor and/or capital requirements. The extent of increase is minimized through the use of a pneumatic control system for multiple daily feedings of cows in stanchion/tie stall barns. When activated by a timer, an air compressor forces a pneumatic cylinder to retract and thus pull an overhead cable extending the length of a barn. Lateral cables attached to the main cable are also pulled, thereby lifting a weighted shut-off ball in the feed dispenser for each cow. This allows grain to flow through the dispenser's throat and drop onto a feed manger. The ball returns to a closed position — setting the feeder for another cycle — when the compressor shuts off and releases the cable-pulling cylinder. Each 2.5-gal polyethylene dispenser in the Grain Brain multi-feeder system is refilled by hand when the dairyman makes his rounds for a regular feeding. A pneumatic control system thus allows unattended operation of every other cow-feeding sequence throughout the day. J-Star Industries Inc., Harvard, IL.





Airfoil-Type Heads Cut Spray Rates

Air-blown nozzles mounted along a sprayer boom can lower the crop application rates of water-and-chemical mixtures. The air from a high-speed blower is channeled to a 13/16-in. wide plastic airfoil located inside each nozzle (or rubber grommet-like housing). Fed into the nozzle through a metering pin, the chemical mixture becomes entrained in air flowing across the airfoil surfaces. The nozzle thus produces an airborne mist of chemicals that penetrates the foliage, covering both leaves and stems. The basic design for an air-blown nozzle develops a circular spray pattern for deep penetration of leaf canopies. This configuration is now complemented with a unit giving a rectangular or fan-type spray pattern, which permits even lower rates per acre. The airfoil-type sprayers are built in widths up to 66 ft and include 5-ft breakaway sections on the outer booms. D & W Industries, Sprafoil Div., Sioux Falls, SD.

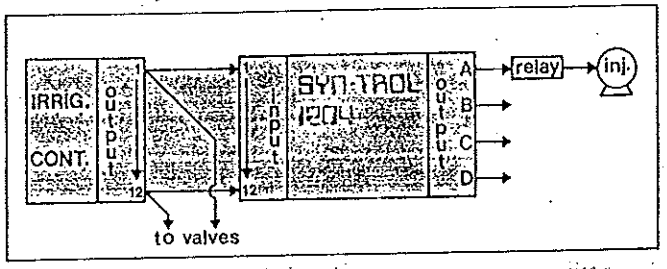


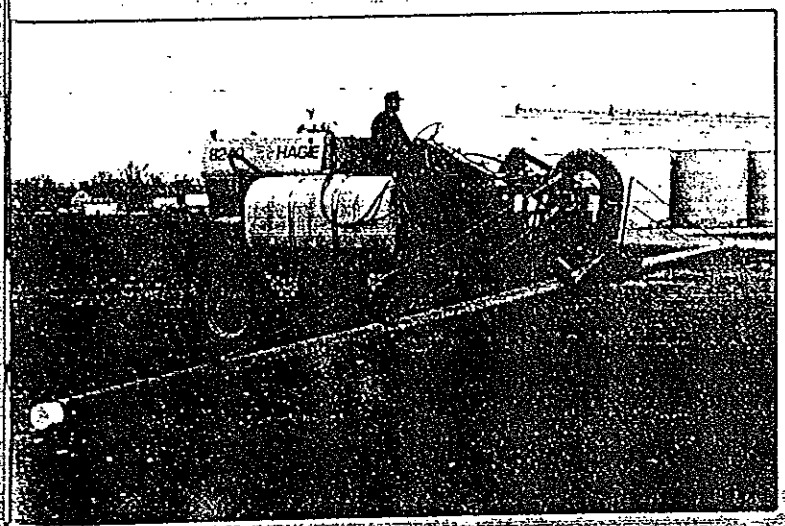
Setting Ring Alters Clutch Torque Levels

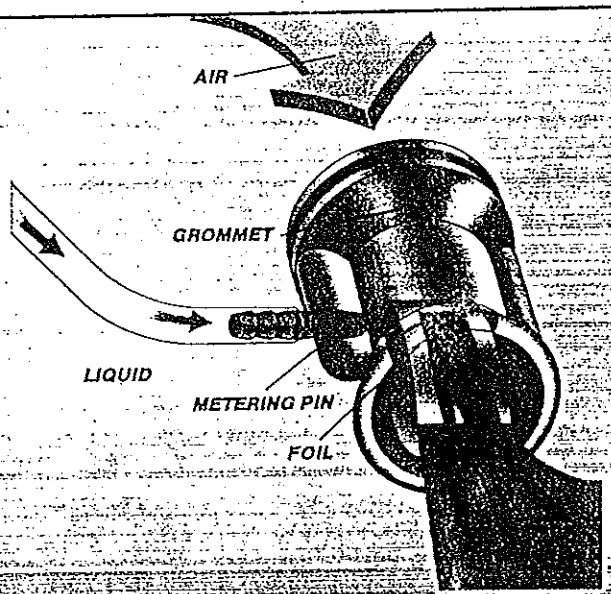
A multi-disc friction clutch can be set for breakout or slippage to occur at 70, 80, 90, or 100% of its maximum rated torque. An implement driveline is often fitted with the clutch set at 80% so that it can be adjusted up or down according to operating conditions and still provide overload protection. The clutch's four different torque levels are obtained with a setting ring located inside the hub end of a cylindrical housing. This ring can be transposed in its edgewise orientation and it can be mated with either the inner or outer row of slots in the housing. Each ring position causes the internal springs to exert a different amount of force against an array of alternate plates and liners. These elements form a clutch pack that is pressed against the inner face of the clutch's yoke end. Total engagement lets both input and output portions of the clutch rotate at the same speed. But slippage is allowed whenever high starting loads and peak torques exceed the friction-based level established by the setting ring. Typical applications of the clutch include machines such as hay balers, rotary tillers, sweet corn harvesters, and pull-type combines. Walterscheid Inc., Burr Ridge, IL.

Programmable Control Runs Chemical Injectors

An integrated system for controlling the injection of fertilizers and chemicals into irrigation lines is formed by wiring an injection controller to an irrigation controller. This arrangement enables the valve-opening signals from the main controller to serve as reference voltages for the auxiliary controller. Based on an EEPROM device, the programmable controller can monitor up to 12 separate valve stations and generate output signals for up to four injection relays. These signals can be sent sequentially or in any combination. Each output is separately programmable for both delay and application intervals ranging from 0 to 6,000 min (100 h). The Syn-Trol 1204 injection controller has a standard LCD display and an optional printer for hard-copy output, reports the Mazzei Injection Corp., Avanti Div., Bakersfield, CA.







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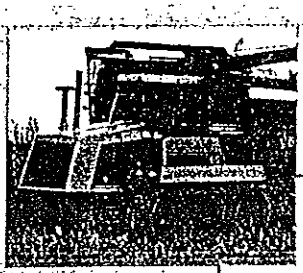


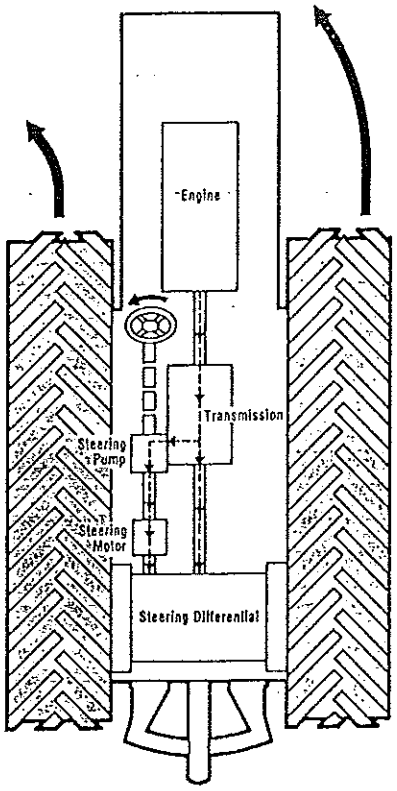
Cleat-Lined Belts Replace Steel Tracks

Flexible rubber belts replace hinged steel grousers as traction devices on a new agricultural tractor built by Caterpillar Inc., Peoria, IL. The tractor's tread-laying belts are 1.5 in. thick, reinforced with steel cable, and have angled cleats that vary in height from 1.5 to 2 in. The two belts are each 24.5-in. wide with a static footprint of 106 in., providing a total ground contact area of 5,194 in.^{2}.

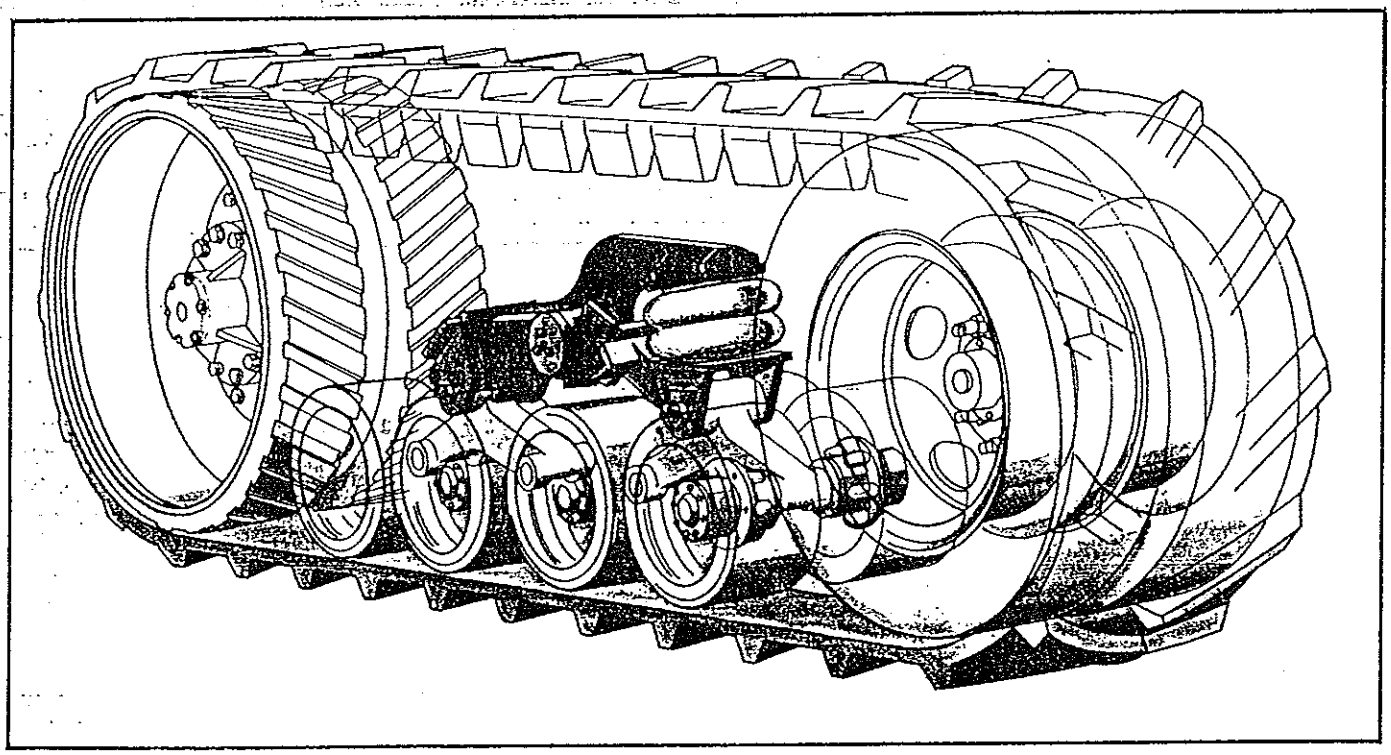
Each traction belt is friction driven by a set of dual rubber-clad drive wheels having a diameter of 40.7 in. Belt alignment is preserved by a row of internal centerline lugs that seat in grooves formed by dual halves in both the rear drive and front idler wheels. An unpowered front idler wheel consists of two 38.25-in. diam pneumatic tires mounted on a pair of standard truck rims.

Mid-belt support is provided by four pairs of rubber-rimmed bogie wheels. In rolling against the tractive belt, these 15-in. diam wheels help to maintain belt-to-soil contact between the drive and idler wheels. An adjustable air-bag suspension system exerts a downward pressure on the bogie wheels. Also, a spring-loaded tensioning system keeps the belts taut during tractor operation.

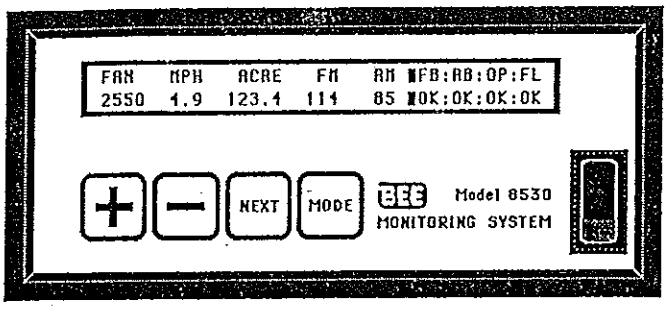
The Mobil-trac system is featured on a 270-hp tractor said to combine the high tractive performance and moderate soil compaction of tracklayers with the on-road mobility of rubber tires. The 29,700-lb Challenger 65 tractor also is configured to handle drawbar loads typical of agricultural field operation.

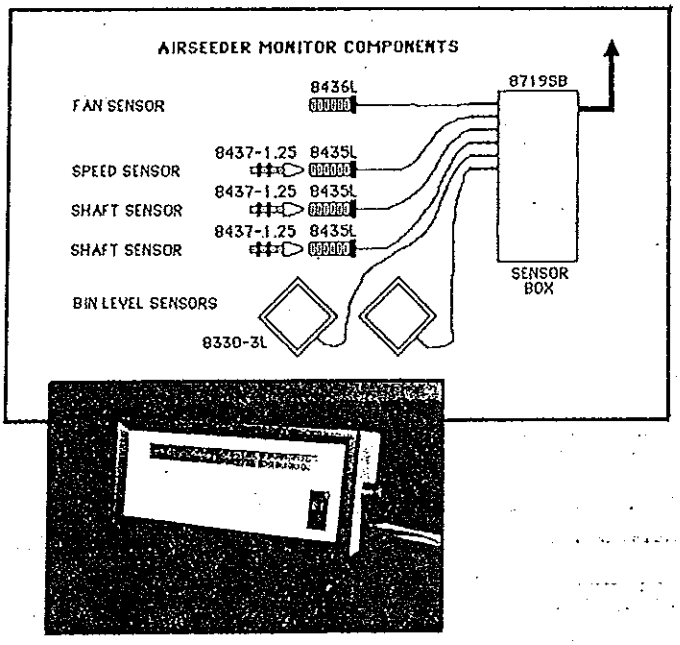


POWER TURN



Chip-Based Monitor Tracks Machine Functions

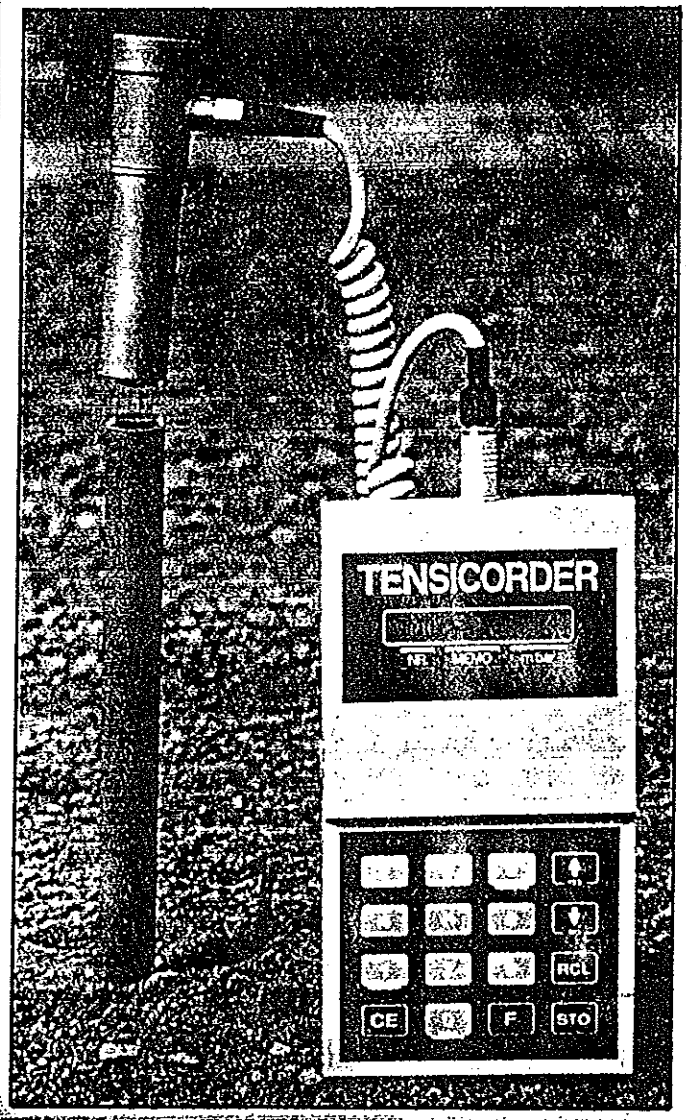




A single-chip microprocessor is the heart of an electronic monitoring system developed originally to track key functions in air seeders. The modular component simplifies monitor circuitry, thereby reducing unit size, improving operational reliability, and cutting system cost. A dot-matrix LCD display allows several functions to be displayed and updated simultaneously. The generalized console layout also permits the same system to be used for different equipment applications. Thus, when mated with proper combinations of sensors, the monitor can work with crop sprayers and grain combines as well as air seeders. The system can accommodate two high-speed inputs (for use with radar speed sensors or fan sensing devices) and eight additional switch inputs. Information from the switch inputs can be displayed as timed values (speed, rpm, or rates) or on/off switch values (bin levels, implement up/down, low oil pressure, etc.) Other system features include a high-speed serial link to a flow monitoring system or to an auxillary processor, and a programmable audible alarm for changes in shaft speed. Various combinations of wheel, shaft, fan, bin level, and flow sensors may be used with the 8530 Monitoring System, reports Baker Electronic Enterprises Inc., Edmonton, Alberta.

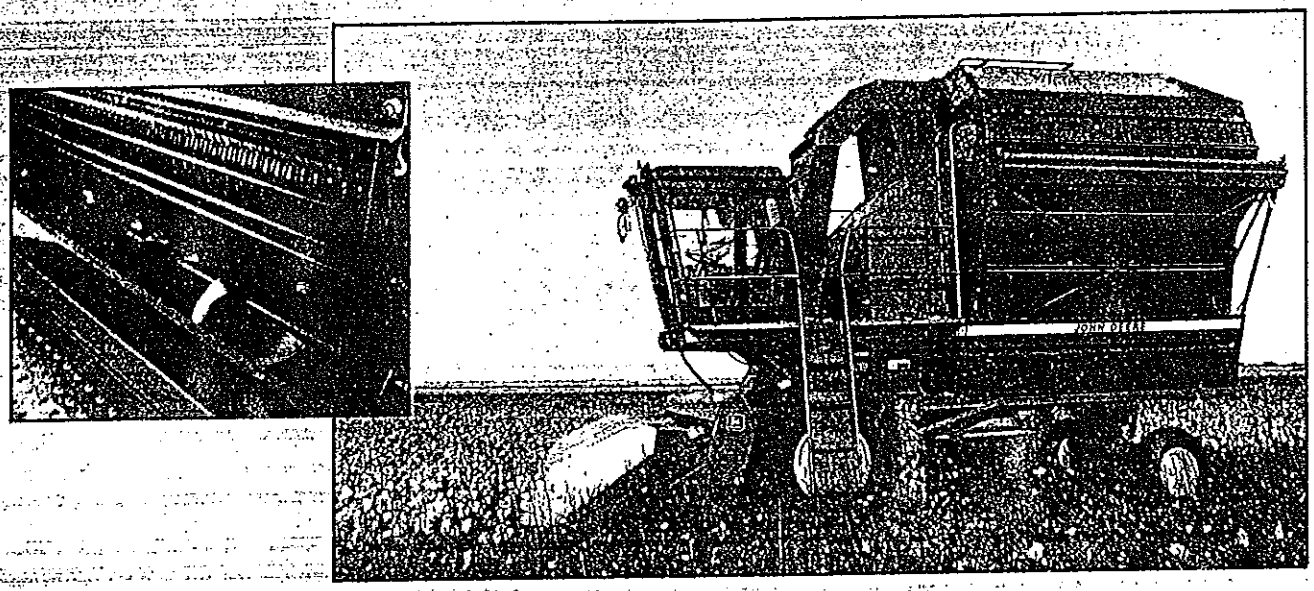
Pipe-Topping Device Records Tension Data

Hand-held recording device is teamed with a needle-tipped pressure transducer for taking readings of field-placed tensiometers. To determine the tension of moisture in soil, the needle probe is inserted through the septum stopper of a tensiometer. Pressure inside the tensiometer is then detected with a sensitivity of 1 mbar, producing a millivolt output that activates the recorder's signal-processing circuits. Each reading is displayed on a digital screen and stored in a nonvolatile RAM-type memory that holds up to 999 data readings. Equipped with an RS-232C port, the recorder can also transfer data to a computer or printer. In addition, the device can function as a single-channel data logger for instruments such as infrared thermometers, thermopiles, and pyranometers. Built by Soil Measurement Systems, Las Cruces, MN, the Tensicorder is used to conduct irrigation research and to schedule the irrigation of crops.



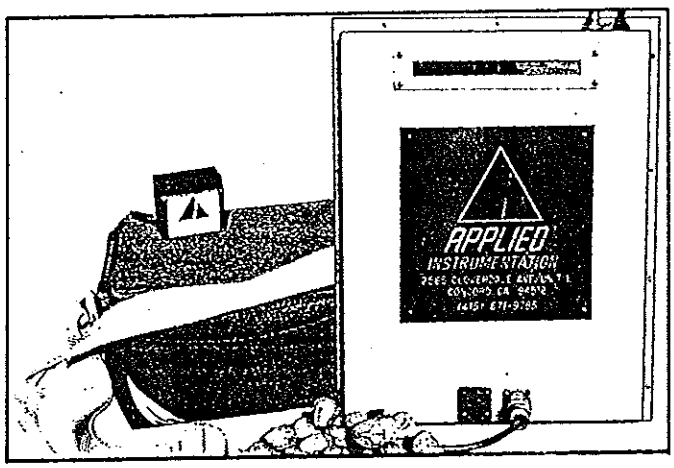
Saw-Drum Cleaner Removes Cotton Trash

A 60-in. wide saw-type cleaner separates trash from seed cotton harvested with the John Deere model 7445 cotton stripper. Located between the cab and basket, the on-board cleaner consists of 13.25-in. diam primary and reclaimer drums. Combined action of the saw-type drums can remove up to 500 lb of trash per bale, thereby improving turnout from 5 to 8% and keeping lint loss under 1%. Trash from both drums falls into a cross auger, which takes the material to a trash chute on the machine's left side for delivery onto the ground. Meanwhile, a four-rotor booster fan delivers the crop to an air stream that sends cotton across cleaning grates and into an 808 ft³ basket. A by-pass arrangement in the stripper's air conveyor can shunt cotton into the cleaner or let it flow directly into the basket. Two hydraulic-powered augers in the basket lid serve as load compactors; an optional vane-type system provides extra control when dumping cotton into a trailer or module builder. The machine's 12-function monitor gives information on row units, cross auger, saw cleaner, fan pressure, and basket filling. Brush-type stripping units can be set for 17 different row configurations involving four, five, and six units. Built on a 144-in. wheelbase with an 80-in. tread width, the 18,200-lb stripper is powered by a six-cylinder diesel engine having a 359 in.³ displacement and 135-hp output. John Deere Des Moines Works, Des Moines, IA.



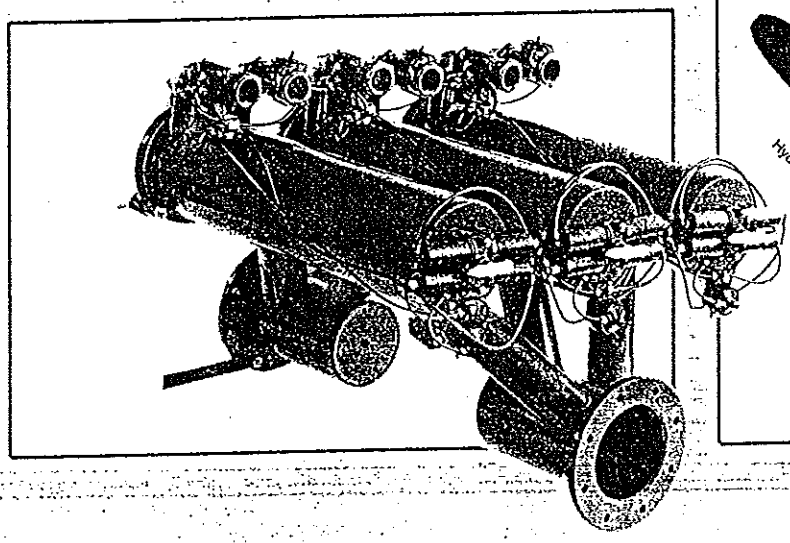
Meter Enhances In-Bin Monitoring

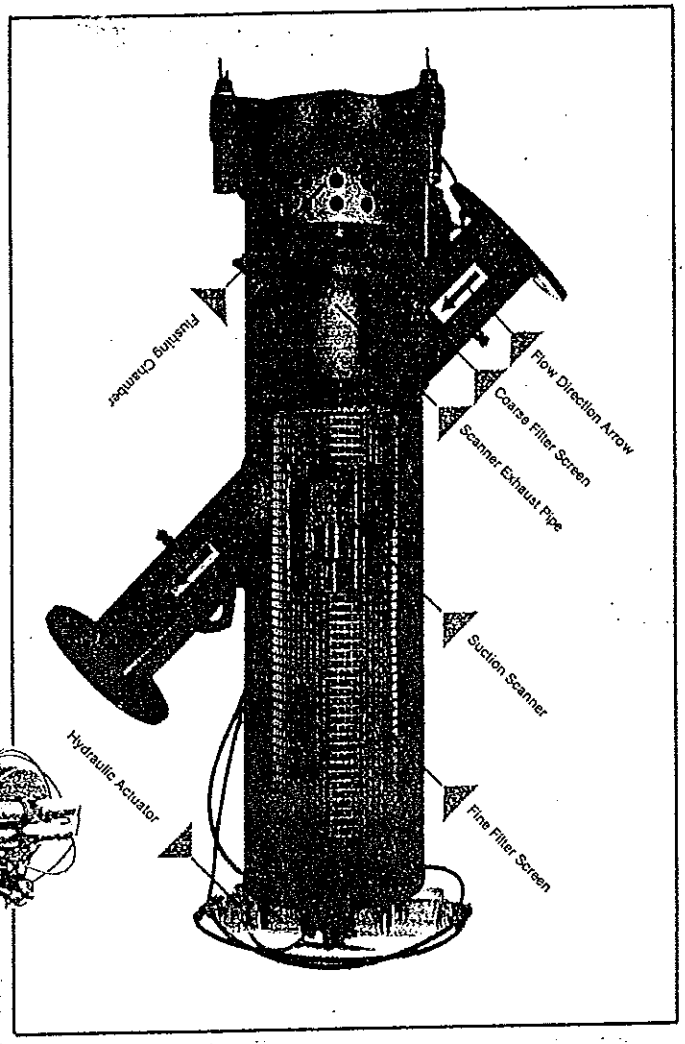
Existing bins or hoppers can be fitted with sensors and controls for measuring the moisture level of various grains and in-shell nuts. The microprocessor-based system continuously monitors the contents of dryer bins, truck loads, and storage structures. An in-bin system thus offers a number of data communication and process control capabilities. For example, a system can be teamed with a controller to automate dryer operation according to product moisture content rather than time, temperature differential, or other factor. Accuracy of the measurement technique is claimed to eliminate the need for a destructive grinding of product samples such as walnuts and macadamia nuts. The meter is made by Applied Instrumentation, Concord, CA.



Rotary Suction Device Cleans Water Filters

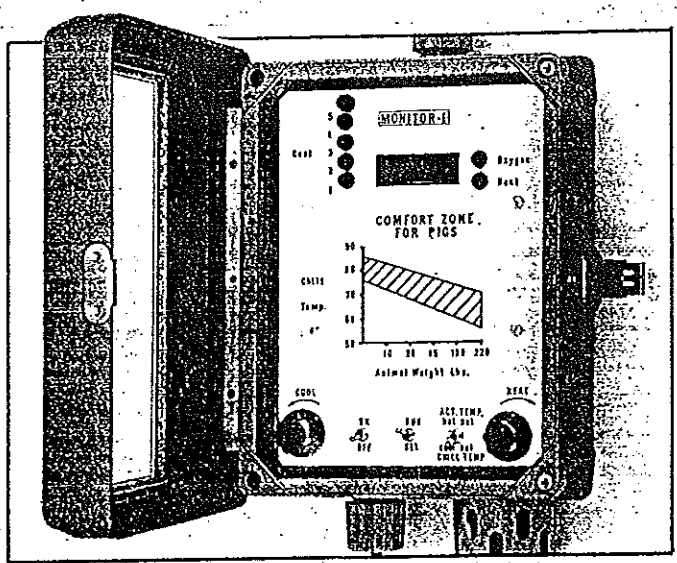
A water-driven rotary device turns through 365 deg to suck away dirt from the inner surfaces of cylindrical filter screens within irrigation lines. Dirt dislodged by this "suction scanner" is then expelled with back-flushing water through an open exhaust valve in the housing of 2 to 14-in. diam filters. The automatic cleaning cycle is triggered whenever the difference between inlet and outlet pressures exceeds 7 psi. A pressure differential activating switch responds to an excess pressure drop by closing a pressure sustaining valve, opening the exhaust valve, and causing an actuator to turn the suction scanner. These mechanisms return to their original positions when the cleaning cycle is completed. Water flow is not interrupted throughout the entire 7-s back-flushing process. A fail-safe timer prevents continuous flushing due to a malfunction. Amiad U.S.A. Inc., Reseda, CA.





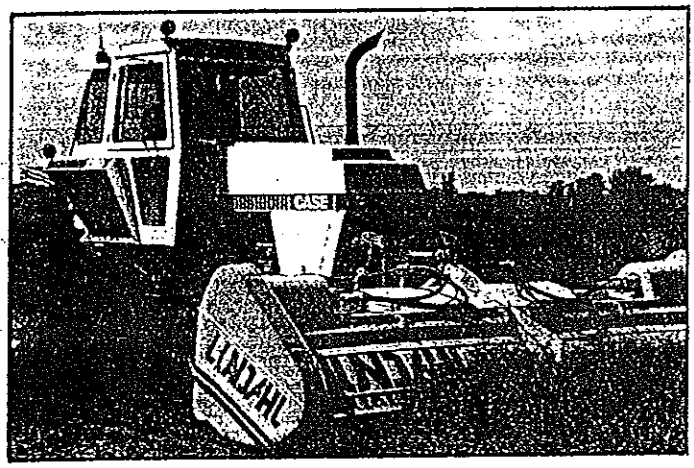
Environment Control Offsets 'Chill Effect'

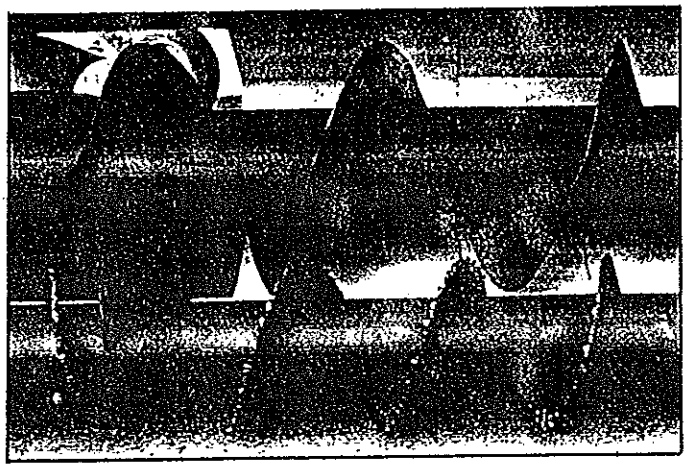
Both the movement and temperature of air are measured by a system for controlling the environment in swine-confinement structures. An allowance for the "chill effect" of moving air is thus factored into programming for the operation of ventilating and heating equipment. In addition, the upper and lower limits of this comfort zone can be adjusted according to changes in animal weight. The Monitor-1 turns on fans at 2°F above the upper setting on the five-level control. It also turns on heaters at the lower setting and turns off ventilation fans at 5°F below that level. The multi-level electronic control for swine buildings is made by Virotek Inc., Owasso, OK.



Crop-Cutting Auger Debuts in Hay Fields

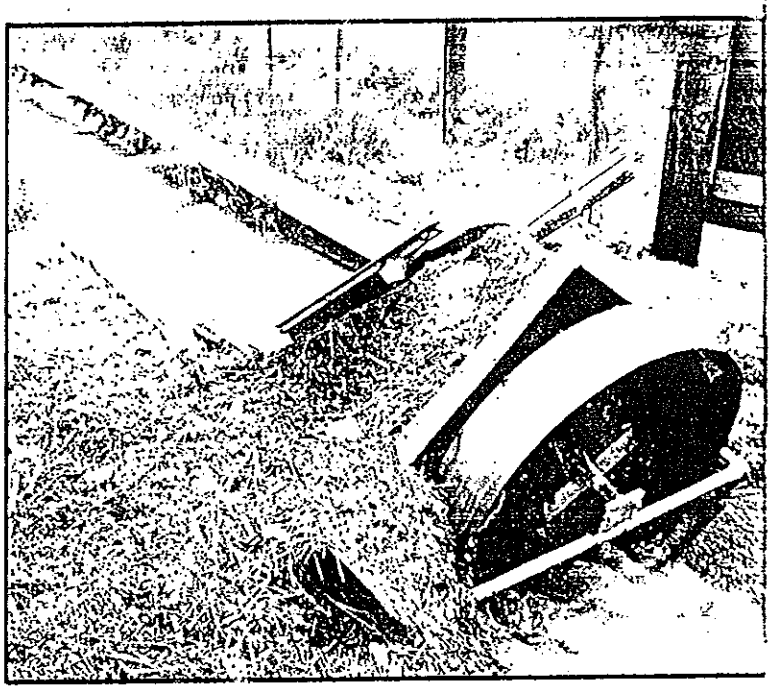
A serrated auger replaces the conventional cutterbar and rotary disc for mowing various hay crops. Both cutting and conditioning actions are produced by teeth notched along the flights of a 12-in. diam auger. The cutting auger operates 1,940 to 2,520 rpm as it severs and lacerates plant material, then delivers the crop to a 21-in. diam cross auger. Turning at speeds of 370 to 483 rpm, the upper center-draw auger transports hay to the middle of the machine's housing and deposits it as a double windrow. Deflection shields at the rear of the machine can be raised to give a wider windrow of hay. Called Dualrower, the machines incorporating a two-auger principle are built in cutting widths of 12, 14, and 16 ft. One version of the auger-based cutting head can be front-mounted on a tractor; another variation attaches to a tractor's rear three-point hitch. The crop cutter also can be run at slower auger speeds for inverting and fluffing windrows of hay. Ezra C. Lundahl Inc., Logan, UT.





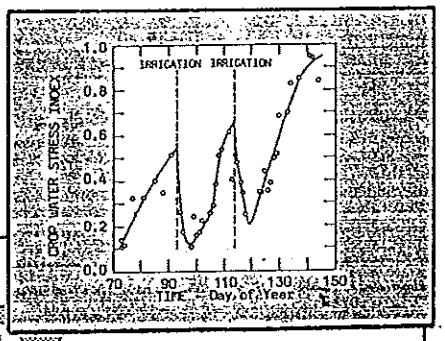
Water Turbine Powers Ditch-Cleaning Machine

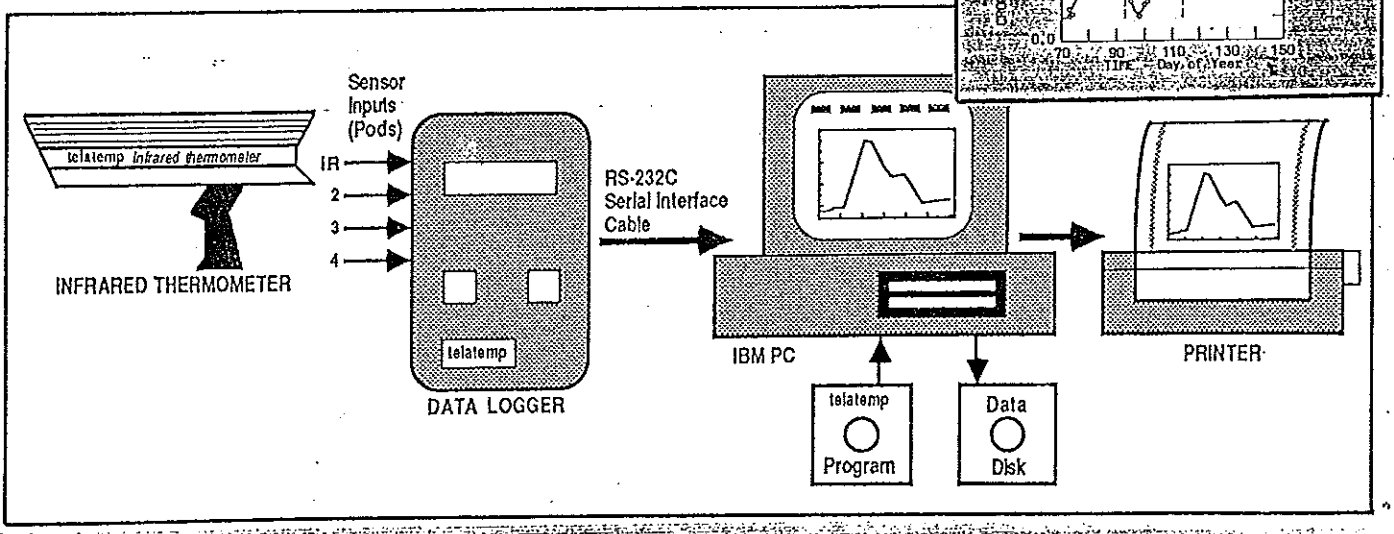
A water-powered turbine wheel imparts a counter-rotating action to the screen and sweep arms of a trash-removal machine for irrigation ditches. The water-borne debris collects against a 34-in. diam screen (with 3/16-in. diam holes), which is inclined at 40 deg and driven through a right-angle gear drive. This drive engages teeth in the screen's periphery and provides a 50:1 reduction ratio. Screen rotation lifts trash above the water level so that two arms with rubber wiper paddles can sweep across the screen's upper surface, throwing the trash onto a sloping platform for deposit alongside a ditch. Each point on the screen is wiped four times before it re-enters the water. The wiper arm rotor is mounted on the same shaft as the screen drive gear and the water-powered turbine, which is located behind the machine. The shaft includes a universal joint, stainless steel bushings, and water-lubricated nylon bearings. Ogee-shaped blades on the turbine — which is inclined at 18 deg — can operate in water depths of 4 to 20 in., and handle flow rates up to 5 cfs. The Trash Remover is built by Irrigation Systems Co. of Western Colorado, Fruita, CO.

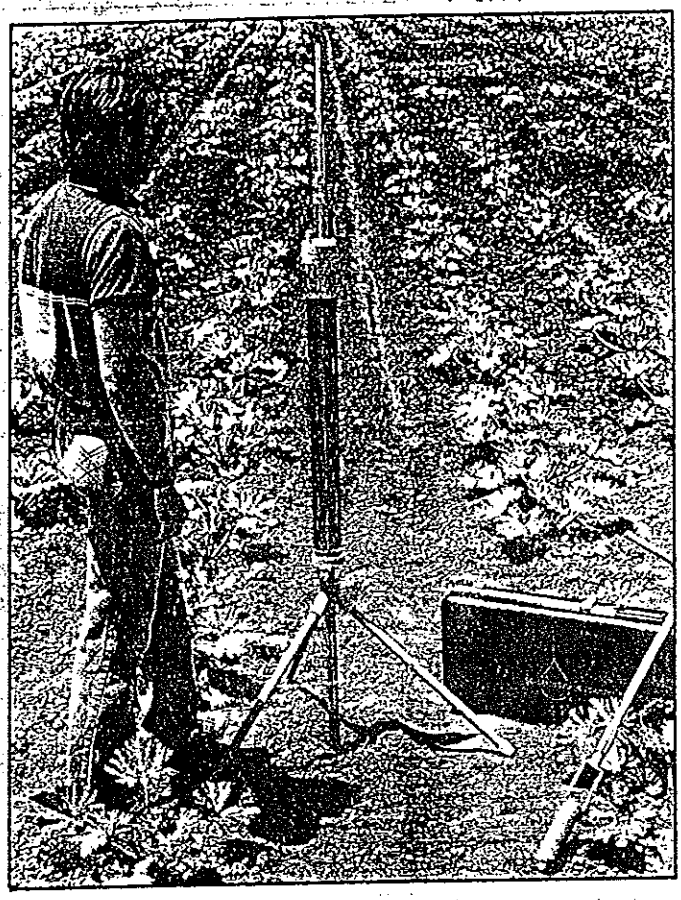


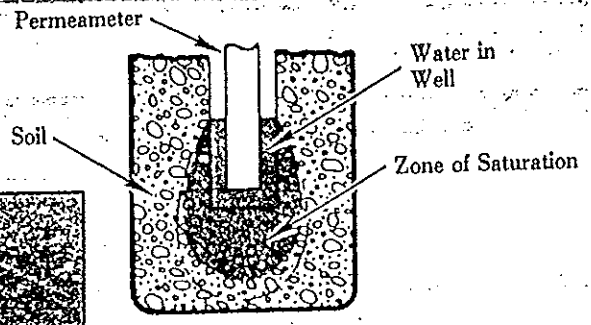
Menu-Driven Logger Compiles CWSI Data

A hand-held instrument logs four channels of data permitting calculation of the crop water stress index (CWSI). One channel is reserved for plant canopy/leaf termperature data generated by a portable infrared thermometer. The other channels receive input from analog and digital sensors for solar radiation, relative humidity, and air temperature. Environmental data recorded by the RR400 data logger can be programmed with a two-key panel, displayed on an eight-character LCD, stored for up to 100 days, and uploaded to an IBM or compatible personal computer. A menu-driven software program enables the user to review, analyze, store, and report data with hard-copy printouts. A program also plots X-Y axis data, computes minimum/maximum or average values, combines up to nine plots, and annotates the plots with text messages. The overall system for CWSI data acquisition and analysis — data logger, infrared thermometer and application software — is offered by Telatemp Corp., Fullerton, CA.



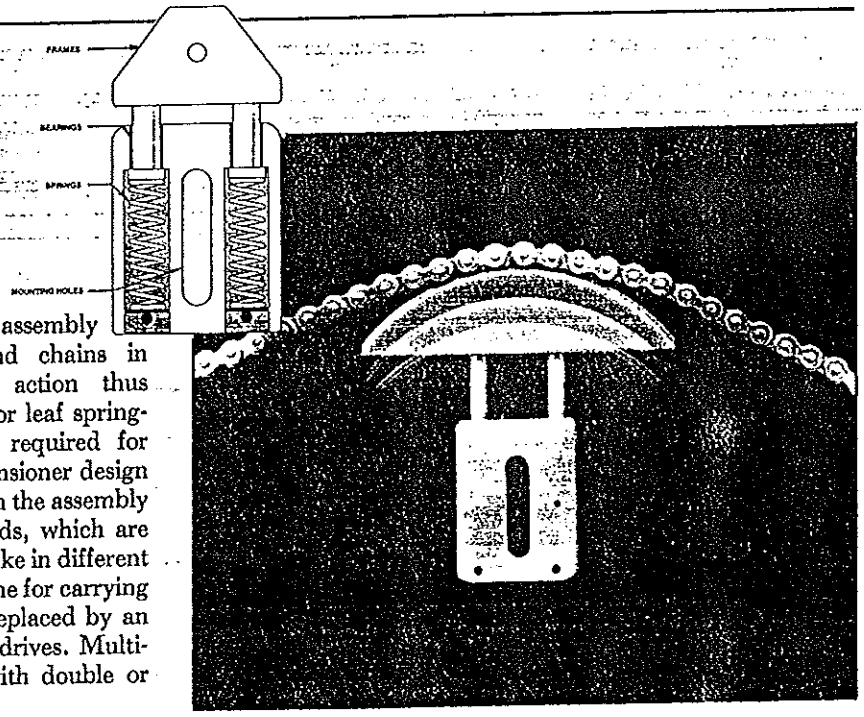






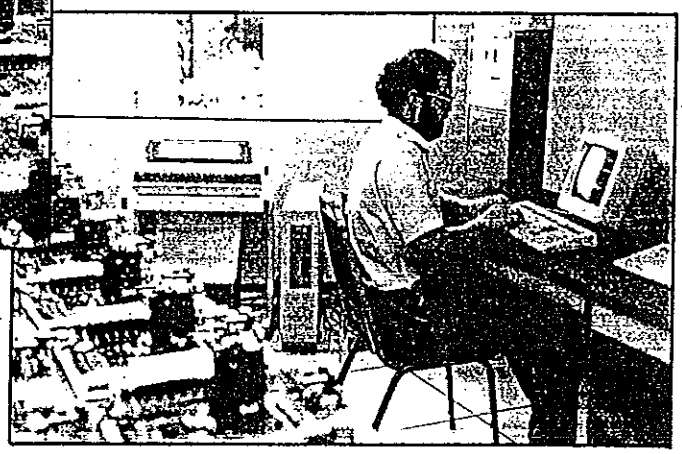
Zone-Soaking Tool Reveals Flow Data

Key factors governing the movement of water in unsaturated soil are determined with an instrument called the Guelph Permeameter. Emplaced over an auger-based "well," the tubular apparatus releases water to form a distinctive bulb-shaped saturation zone that varies according to soil type and well dimensions. Further outflow occurs at a steady state, which can be measured as the recharge rate needed to keep water at a constant depth within the well. Three major forces reflected in this reading are the hydraulic push of water into soil, gravitational pull of water out the bottom of a well, and the capillary pull of water out of the well into surrounding soil. Consequently, the well and rate data provide a basis for calculating the field-saturated hydraulic conductivity, matrix flux potential, soil sorptivity, and the conductivity-pressure head relationship. The entire process requires only 2.5 L of water and takes 0.5 to 2 h, depending on soil type. Applications for the portable instrument include drainage design, irrigation planning, permeability studies, and research on erosion, hydrology, and slope stability. Soilmoisture Equipment Corp., Goleta, CA.



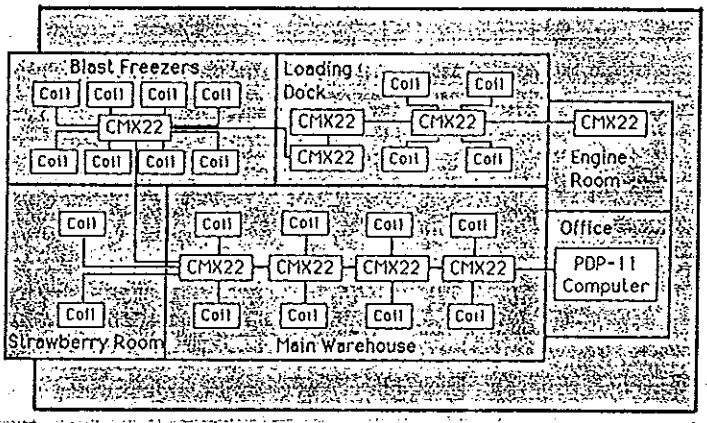
Linear Tensioner Makes Drives Taut

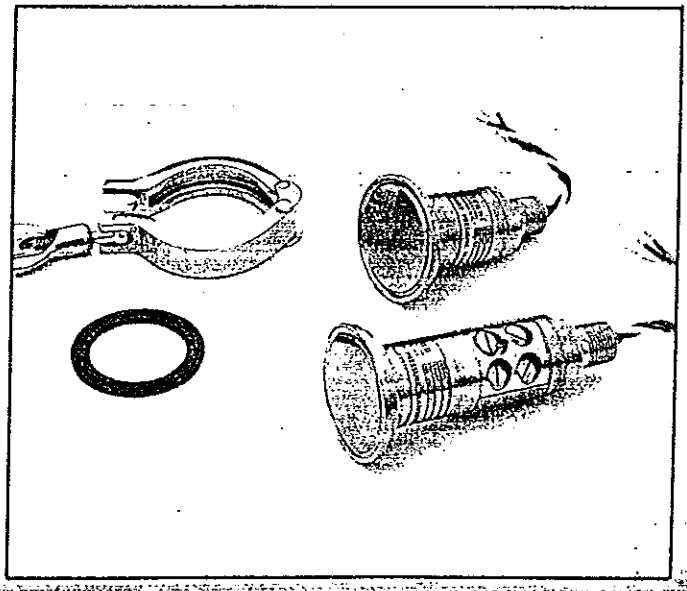
The reciprocating motion of a spring-loaded assembly maintains constant tension of belts and chains in equipment drives. An automatic take-up action thus eliminates the manual resetting often needed for leaf spring-type devices, and the repositioning usually required for conventional slotted idler brackets. The new tensioner design has two coil-type compression springs recessed in the assembly body. These springs push against two steel rods, which are allowed to travel through a 3, 3.5, or 4.25-in stroke in different models. Attached to the rods is a triangular frame for carrying the idler pulley in belt drives. This frame is replaced by an arc-shaped polyethylene guide block for chain drives. Multi-track guides are provided for roller chains with double or triple strands. EFSON Inc., Hauppauge, NY.

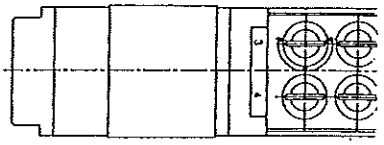


Food-Cooling System Cuts Energy Costs

Previously separate elements are integrated in a computerized system that automatically monitors and controls the operation of evaporators, condensers, and compressors in a refrigerated warehouse. Earlier designs used personal computers to monitor some functions and depended on timers or process controllers to partially automate various subsystems. Hardware for the new system consists of a DEC PDP-11 minicomputer, display monitor, keyboard, printer, modem, multiplexers, and sensors for measuring pressure, temperature, humidity, valve positions, current, and power. These elements are combined in a centralized system that automates the monitoring and conrol of an entire refrigeration system for processed food products. However, an operator can easily change key parameters such as set points, dead bands, and delay times through a simple procedure at the keyboard. Software is used to improve system efficiency and lower energy costs by reducing defrost heat loads, reducing fan-operation heat loads, controlling coil usage, and incorporating utility variable rate structures into the coil operation. Levy Systems, Campbell, CA.







Flush Diaphragm Keeps Sensor Clean

An unrecessed face is machined into the stainless steel body of a pressure sensor. This integral structure serves as a flush diaphragm that presents a flat contact surface to process media in dairy, food, and pharmaceutical plants. The sanitary design facilitates in-place cleaning and reduces bacterial growth by eliminating corners, crevices, and cavities. Also eliminated is a fluid-filled chamber that could contaminate food products in the event of a ruptured diaphragm. A bonded strain gage sensing element is featured in the hermetically sealed unit. Flush diaphragm pressure sensors are made in ranges for 0 to 5 psi through 0 to 1,000 psi with sealed gage, vacuum, or absolute references. Quick disconnect clamps and integral transmitter units are also offered by Viatran Corp., Grand Island, NY.

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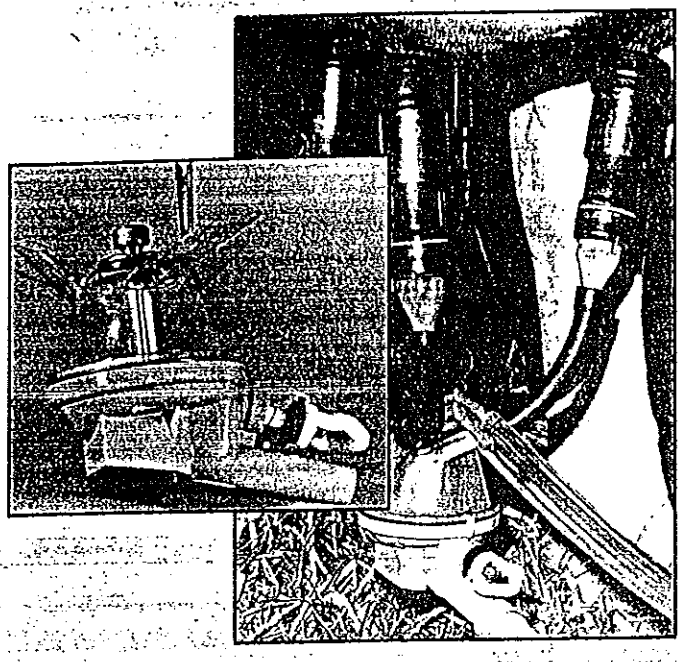
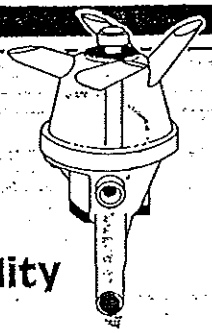




Flow-Taming Claw Enhances Milk Quality

Milk quality and udder sanitation are preserved with a milking claw that fosters smooth rather than turbulent fluid flow. A vortex flow pattern in the milking claw for dairy cows is created as milk enters the unit through four tangential inlets. This smooth whirling motion continues as milk flows down along the claw's conical body. A spiral-shaped bottom then directs the milk out through a single outlet. Called Flo-Star, the design combining these flow-taming geometries is claimed to maximize throughput while minimizing the splashing and areation of milk. This patented arrangement conserves vacuum energy, enhances milk quality, and reduces potential cross-contamination — a situation where mastitis-causing organisms can transfer from one teat to another through a milking claw. The design also features a see-through plastic body and an automatic vacuum shut-off valve, reports the Dairy Equipment Co., Div. of DEC International, Madison, WI.

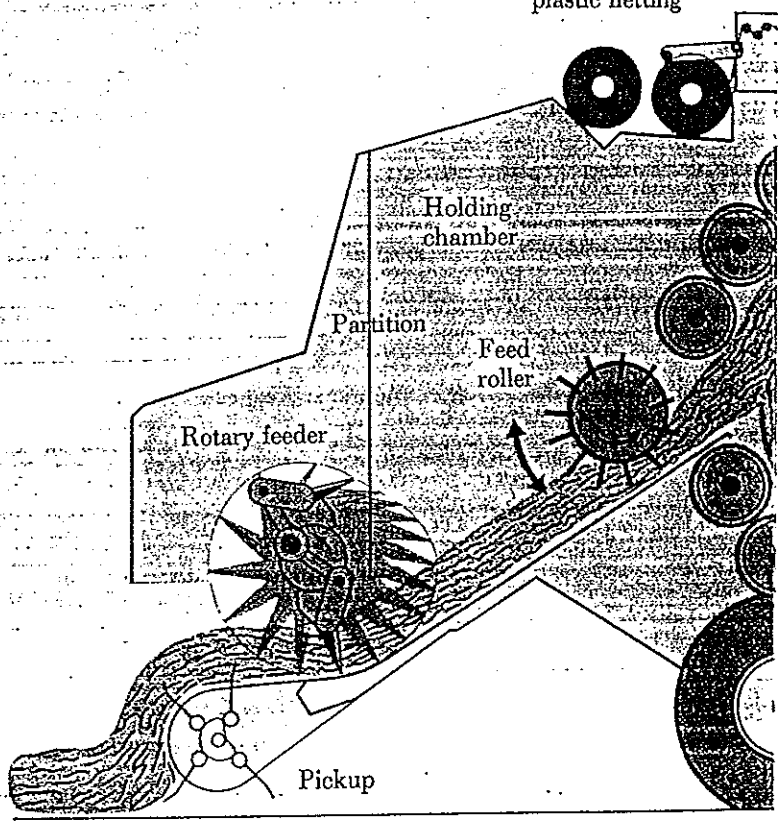
Hay-Holding Bin Allows Non-Stop Round Baling

Three major developments enable a large round Claas baler to form, wrap, and eject bales without stopping along a windrow. The incoming hay or straw is momentarily stored in a holding chamber while an existing bale is completed. Each bale's wrap/eject cycle is shortened by a plastic net wrapping and a fast-acting tailgate. In addition, key baler functions are synchronized with electronic and hydraulic devices.

An undershot rotary feeder with two arm-driven rakes continuously moves hay into the Rollant Rapid 56 baler. The material is pushed under a slotted partition toward the tined feed roller, which transfers the hay into a bale-forming chamber. An electromagnetic clutch disengages the feed roller during a bale's wrap/eject cycle, causing the hay to accumulate in the holding chamber. This chamber is emptied when the feed roller re-engages and floats — by means of spring-loaded pivot arms — atop the hay.

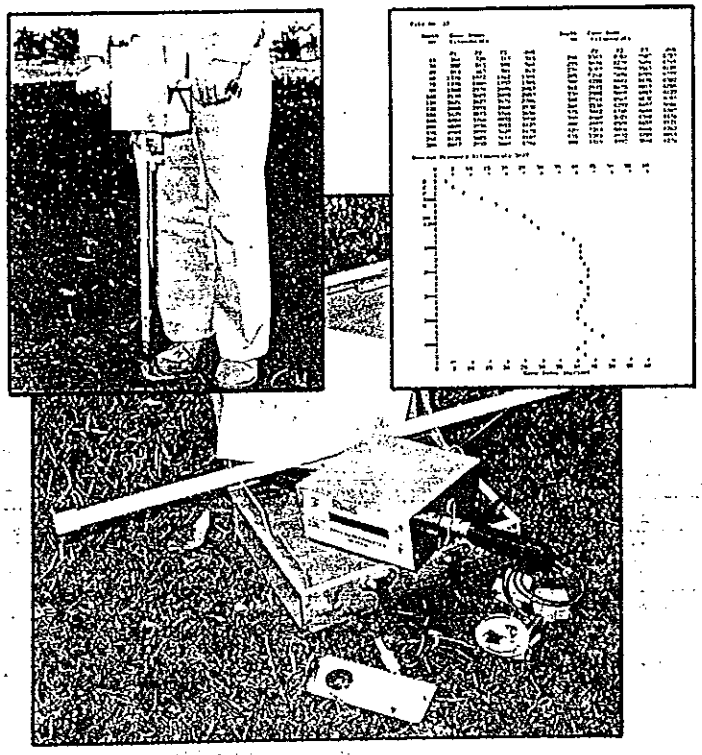
Several features help to shorten the "dwell time" for finishing off a bale. A conventional twine-wrapping sequence often involves 4 to 15 revolutions and takes up to 60 s. The edge-to-edge plastic netting requires only 1-1/2 to 3 wraps and takes about 10 s. Also, the bale is formed in an over-center position, which lets it roll out of the chamber when two double-acting cylinders open the tailgate.

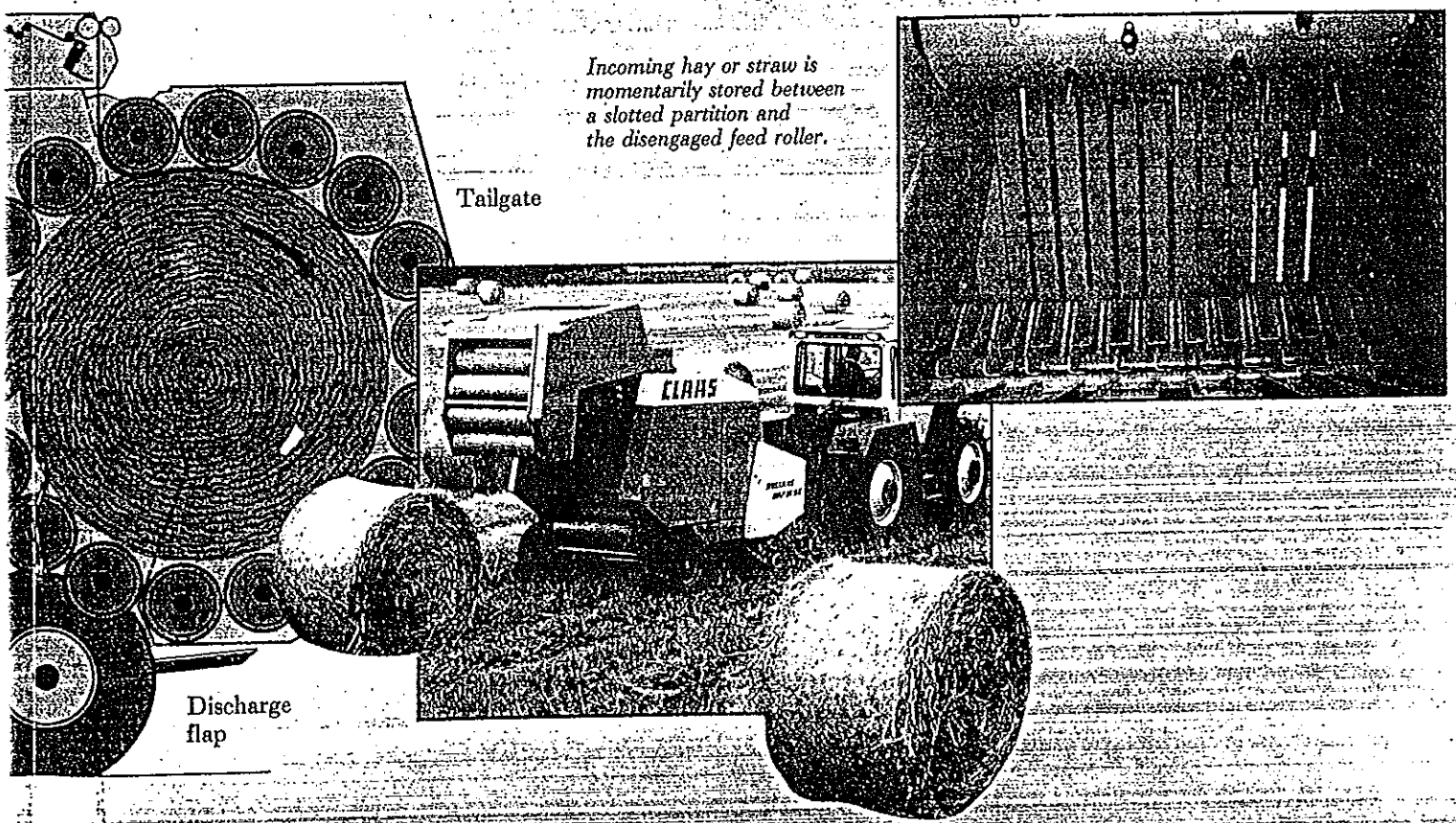
The baler's storage, wrap/eject, and other functions are coordinated through a self-contained hydraulic system and microprocessor-based control system. Numerous reed switches also help to maintain the correct operating sequence, reports Claas of America Inc., Columbus, IN.



Chip Helps Collect Cone-Index Data

A microprocessor-based cone penetrometer acquires cone-index data at 0.6 in. (15 mm) intervals over a depth range of 18 in. (450 mm). In controlling all instrument functions, the single-chip device measures force and depth factors, monitors cone insertion speed, stores 9,000 data values, retrieves data files, and sends the data to an LCD display, printer or RS-232 port (for computer processing). The 16-character LCD display provides operator prompts and allows field viewing of the recorded data. A buzzer sounds when the probe reaches a depth of 18 in. and when insertion speeds are too fast or too slow. Data are stored in memory as a file of force data from three probe insertions made within close proximity of each other. The 32K memory holds up to 100 files, each consisting of 90 force values. Printer output is a formatted listing of these cone-index values plus a graphical plot of the average data in each file. An optional 64K memory can store up to 250 files. The CP10 electronic field instrument is used for compaction, tillage, and trafficability studies, reports Rimik Pty. Ltd., Toowoomba, Queensland, Australia.





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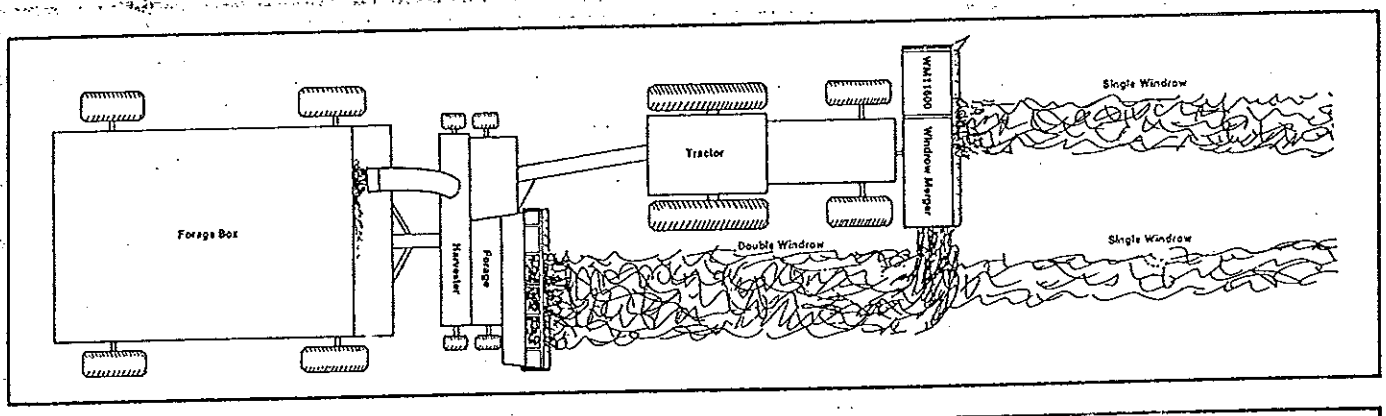
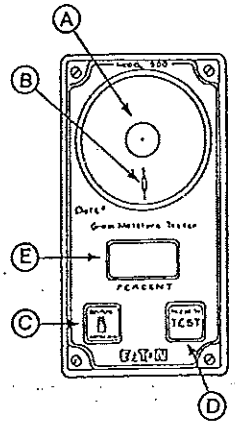
Front-Mounted Pickup Merges Forage Windrows

A conventional bar-and-tine pickup is combined with a draper-type cross conveyor to form a windrow-transfer machine. The 7-ft-wide pickup is mounted on the front of a tractor to create a double-size windrow of hay for immediate intake by a forage harvester or square baler towed behind the tractor. This arrangement provides full, uniform feeding of plant material to the harvester, permits slower travel speeds while haying, and reduces by half the number of trips through a field. The pickup and conveyor are each driven by hydraulic motors powered by the tractor's hydraulic system. Speed of the conveyor-drive motor can be varied to adjust the hay's placement relative to an adjacent windrow. Built by Gehl Co., West Bend, WI, the Windrow Merger can also be used as a windrow fluffer. Both merging and fluffing capabilities are achieved without the leaf loss or stone problems often experienced when using a conventional hay rake for these tasks. The 1,300-lb unit is 10.5 ft wide and mounted on the front of a 100 hp or bigger tractor.





A. Grain Cell

B. Temperature Sensor

C. Grain Selector Switch

D. Test Switching

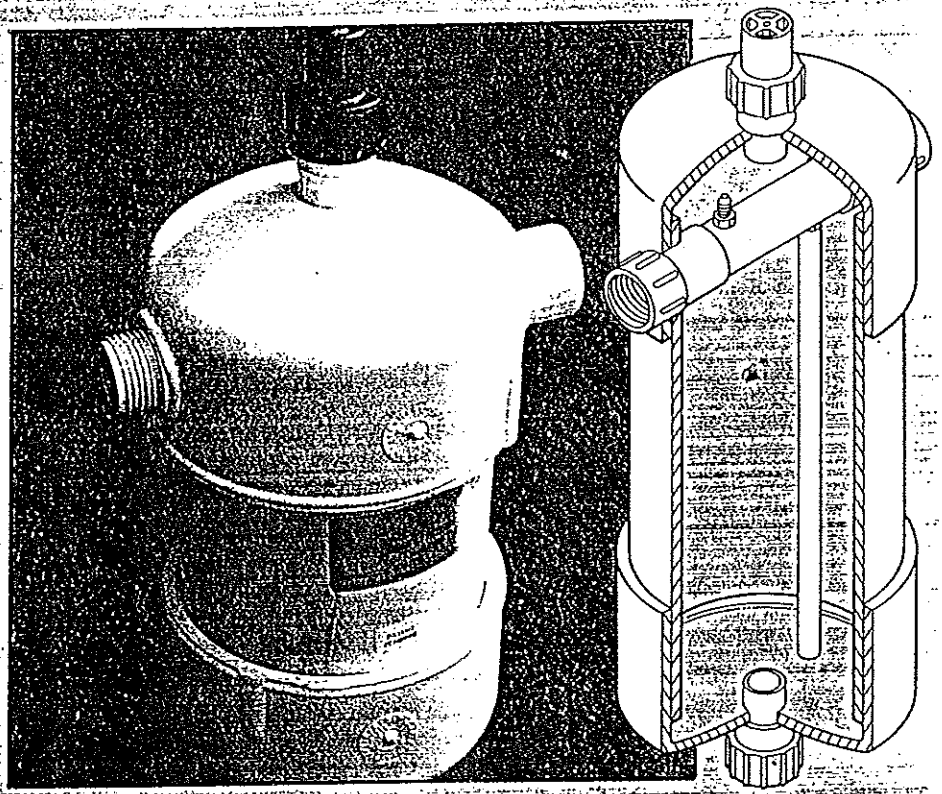
E. LCD

Volumetric Sampler Detects Grain Moisture

A hand-held instrument eliminates the conventional sample-weighing process when measuring the moisture content of field grains. The size of each test sample is determined by the volume of a cylindrical grain cell recessed in the 6-in. long, 3-in. wide, and 2-in. high instrument. This cell is filled with grain in order to test the moisture content to the nearest 0.1% within a range of 7 to 40%. A cell-bottom thermal sensor is included in the signal-processing circuitry to compensate for grain temperature and thus adjust the readings provided by a three-digit, 0.5-in. high LCD display. Direct readings are made for corn and soybeans; conversion charts are supplied for other grains. The battery-powered moisture tester is made by Eaton Corp., Controls Div., Carol Stream, IL.

Flow-Actuated Unit Injects Chemicals

A batch-type unit injects chemical or fertilizer into the main water line of small-scale sprinkler or drip irrigation systems. The flow-through design is internally ported so that a small amount of water flows into the tank, displaces some of the liquid concentrate, and forces the mixture back into the main flow of water. In employing a differential-pressure technique, the flow-actuated unit gives higher injection rates at larger water flow rates. Called the Add-It, the injector system operates without pressure loss, auxiliary pumps, or other power sources. Trickle Soak Systems, Santee, CA.



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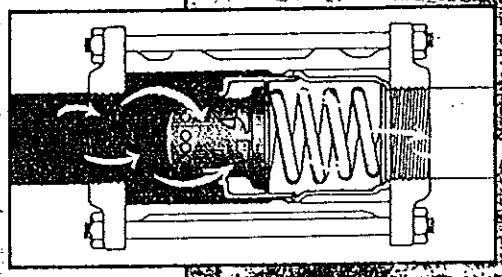
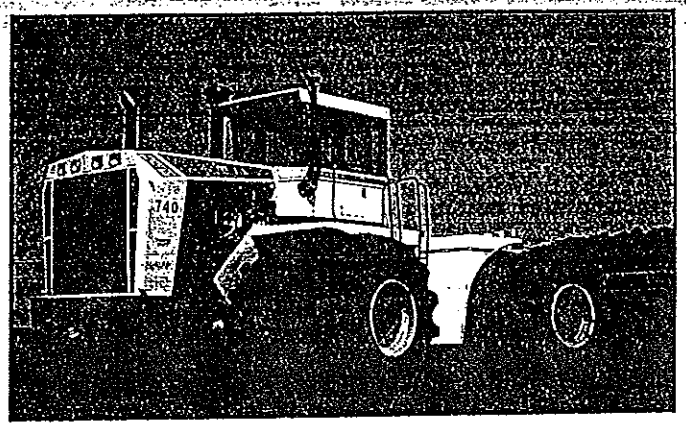
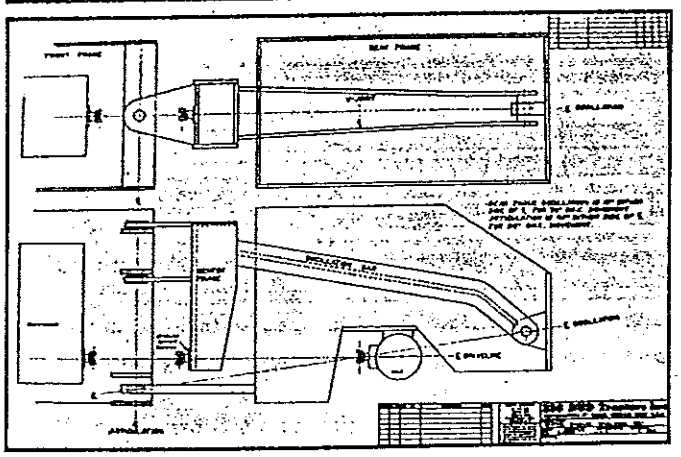


Flow Controls Equalize Irrigation Distribution

Conventional techniques for allocating water within irrigation districts often let some growers use excess amounts while others get inadequate flows. These inequities have become increasingly objectionable due to the limited supplies and rising costs of water. A solution to the problem involves the use of flow-control valves previously featured in industrial and HVAC applications, reports Griswold Controls, Irvine, CA. When installed on the supply line to each farm, a flow-control valve protects against an overdraw that could otherwise cause a substantial loss of pressure in the main line distribution system and deprive neighboring units of an adequate flow. The spring-loaded devices work on a restrictive-flow principle that keeps the flow rates within preset limits. Valves for regulating the distribution of irrigation water are made in 0.5 to 30-in. sizes to handle flow rates of 0.5 to 12,750 gpm.



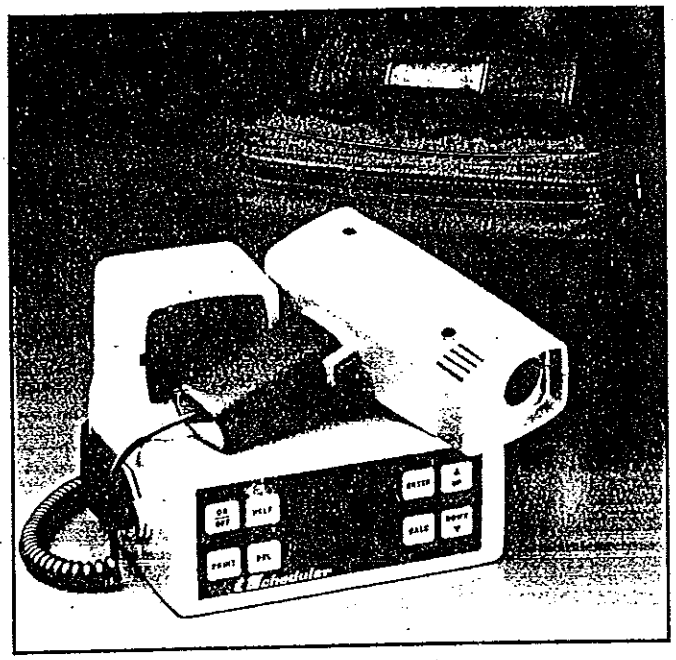


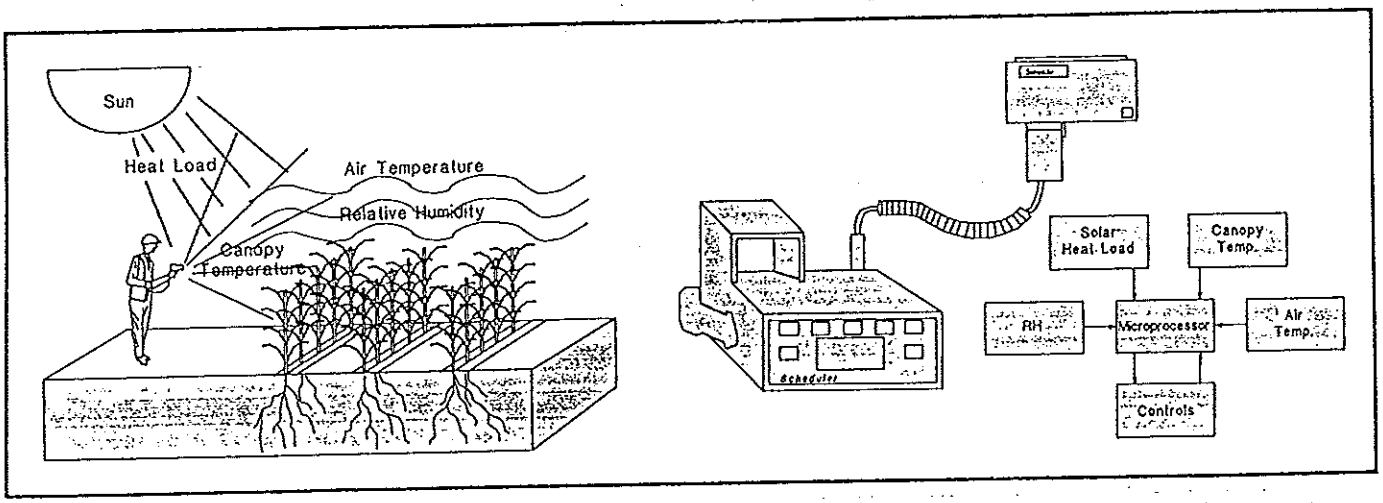
Frame-Tilting Geometry Eases Driveline Design

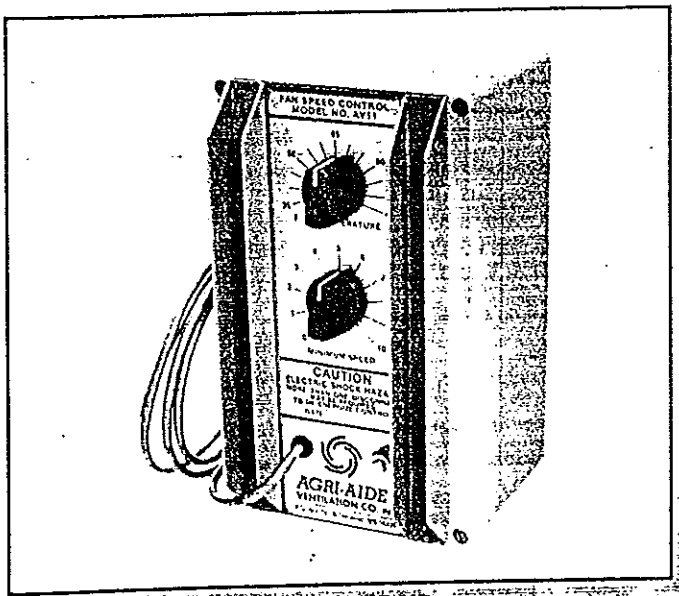
Rear frame oscillation is eliminated as a factor affecting driveline alignment in a big 4-wheel-drive tractor. Rather than make centerlines for the two aspects coincide, a new design allows an oscillatory inclined centerline to converge with the driveline's horizontal centerline at the U-joint for the rear axle. This arrangement lets the rear frame and axle oscillate ±15 deg along the pivot points without disrupting driveline alignment and causing powertrain vibration. Located along the vertical centerline for articulation, one pivot serves as the rear-to-front frame attachment point. The other pivot is located behind the rear axle where the frame attaches to an oscillation bar extending from a center frame that, in turn, allows ±40 deg of articulation. A spherical ball bushing supports the frame at each of the two pivot points. The new attachment geometry simplifies driveline design by concentrating on articulation alignment, and reduces from 11 to 7 the total of chassis pivot points in 740-hp tractors built by Big Bud Mfg. Inc., Havre, MT.

Plant Monitor Seeks Telltale Stress Clues

A two-part monitoring instrument indicates the presence of plant stresses caused by inadequate moisture, diseases, insect damage, nutritional deficiencies, and other factors. Four sensors in an integrated package generate data for leaf temperature, ambient temperature, relative humidity, and solar radiation load. A 64K microprocessor in the base unit then computes a stress index according to proprietary algorithms developed for specific crops. The information is used primarily to schedule irrigation operations. However, the device also serves as a diagnostic tool when a stress level persists after the crop is watered. Stress index readings can be interpreted on the basis of threshold values, relative values, seasonal trends, and cumulative index values. Data for up to 30 individual fields are stored for 15 days, recalled in tabular form, and presented as graphic plots. All data captured by the Scheduler monitor can be transmitted to a printer or microcomputer for storage or printout. Standard Oil Engineered Materials Co., Solon, OH.







Ventilation Control Varies Fan Operation

A control unit provides several operating modes for the variable-speed exhaust fans used to ventilate livestock confinement facilities. For 4 s during start-up, the control applies full power so a motor can run at full speed to overcome fan inertia and kick open balky shutters. The voltage is then reduced to a level giving the preset minimum operating speed. The variable-speed fan control can operate on either 120 or 240 V lines, control up to 14 fans at one time, and function over a temperature range of 35 to 95°F. In addition, the control provides a choice of low-speed continuous fan operation below the set-point temperature or of fan shut-off below the set-point temperature — a capability that reportedly eliminates the need for separate controls and thermostats. Osborne Industries Inc., Osborne, KS.

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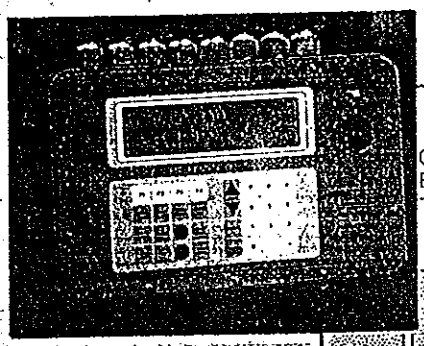
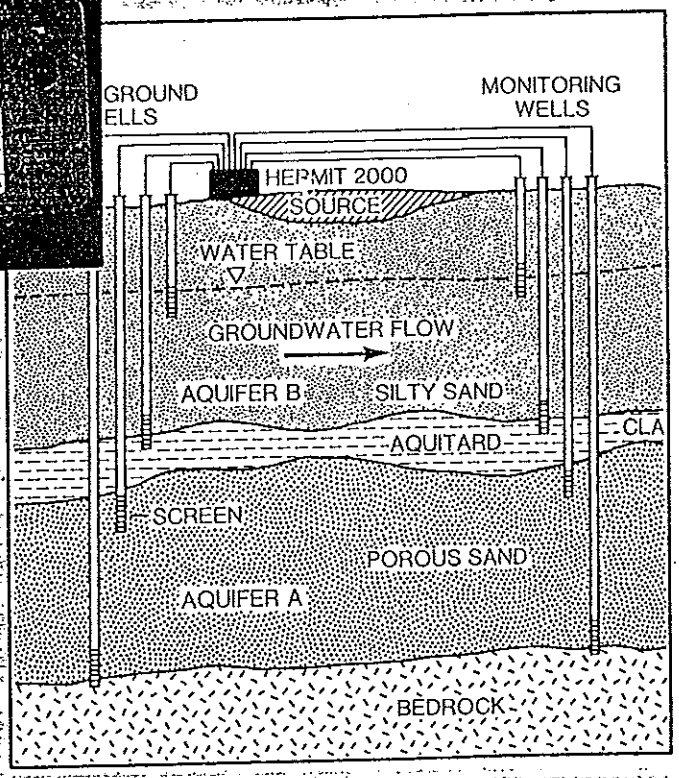
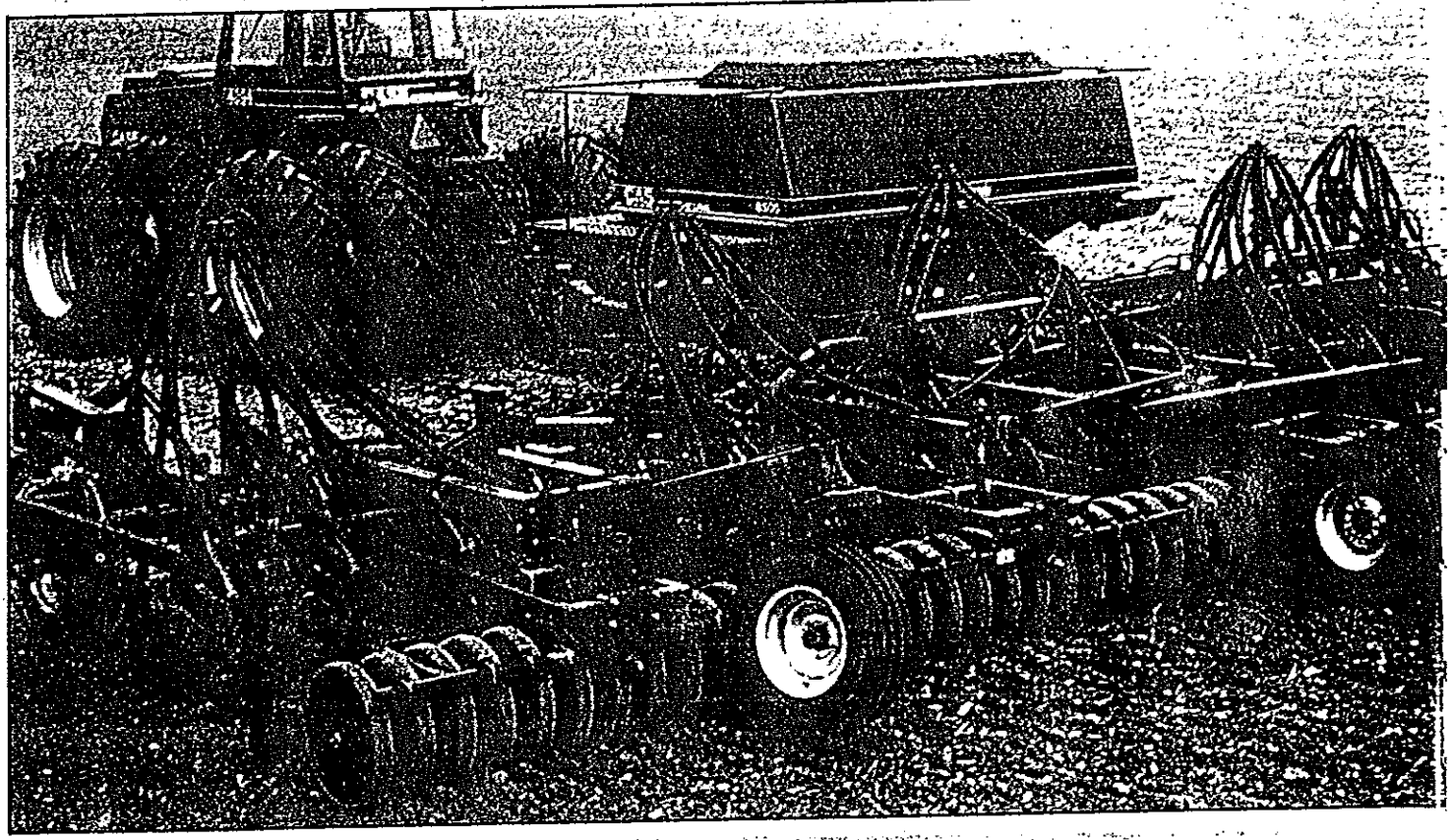




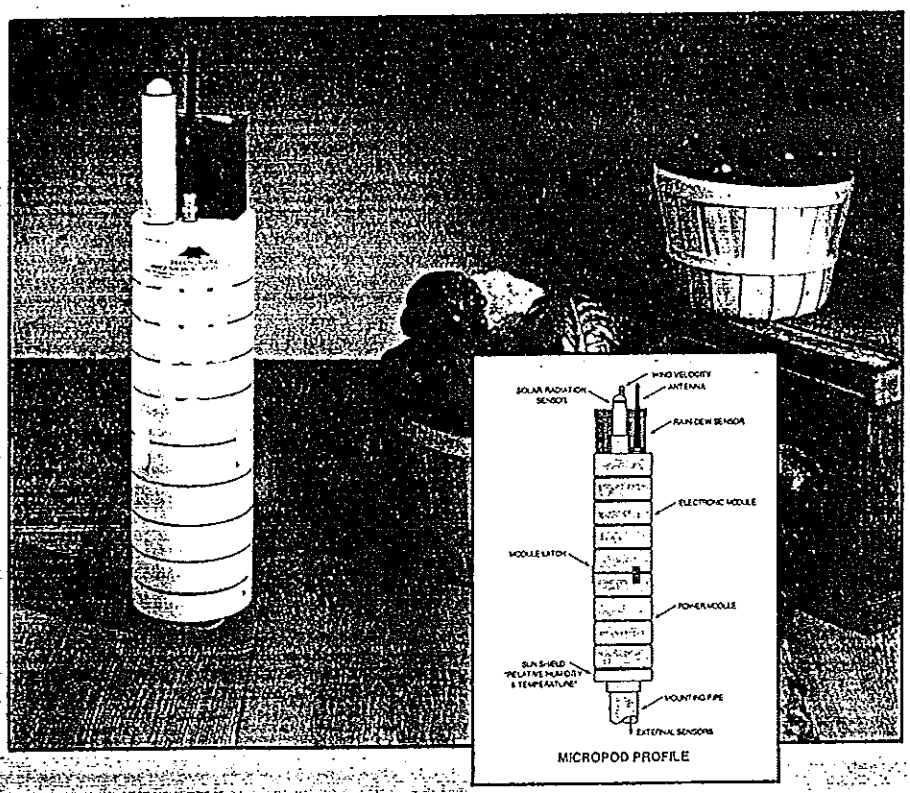
Menu-Driven Monitor Records Water Status

Programmable instrument permits long-term monitoring of the level and quality of ground and surface water. When used for irrigation water management and control, the Hermit 2000 can be teamed with remote sensors for measuring parameters such as level, flow, pressure, temperature, conductivity, and pH. The microprocessor-based environmental data logger can be expanded from 4 to 16 channels of output, and from 16K to 512K of memory. Other features include logarithmic and linear sampling rates, remote interrogation by phone modem or radio telemetry, and interface with IBM or compatible personal computers. The battery-powered instrument has a non-volatile EEPROM memory, two-line LCD display, menu-driven programming, and an automatic alarm for high or low water levels. This alarm can also trigger the start or stop of pumps on other equipment. In-Situ Inc., Laramie, WY.

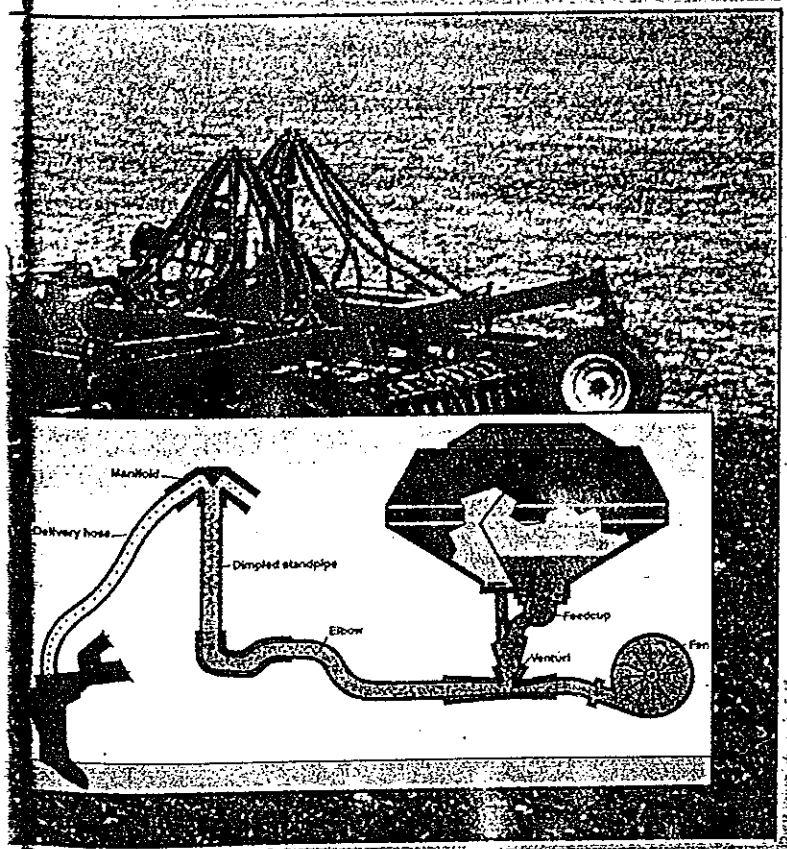


Environmental Station Aids Remote Studies

Eleven types of crop, soil, and weather data are collected by a three-model series of compact meteorological stations for agricultural research and remote monitoring. Two models use FM radio telemetry for the periodic transmission of data to a base computer. The third model features 64K-byte and 128K-byte memory cards that store the data for 6 and 12-month periods, respectively. A basic Micropod station has analog sensor channels for air, crop, and soil temperature; soil moisture; wind velocity; relative humidity; battery voltage; and a spare. The three digital channels are for solar radiation, rain, and dew (leaf moisture). Each station has a 5-in. diameter, 22.5-in. height, and an 8-lb weight. ARAX International Corp., Vanderbilt, PA.



MICROPOD PROFILE



Pneumatic Seed Tubes Feed Hoe-Type Openers

Air-blown seeds are placed along furrows made with hoe-type openers in a 45-ft wide grain drill. The model 8500 air hoe drill consists of a cart-mounted hopper for 150 bu of seed and/or fertilizer plus a six-section frame that follows ground contours and folds to a transport width of 20.25 ft. Configured for row spacings of 7, 10, or 12 in., the hoe drill can clear 24 in. of trash and work in minimum-till conditions. Seed depth is controlled by front-mounted gauge wheels and the rear press wheels. For each bank of furrow openers, an internally fluted feed cup meters the seeds to the throat of a plastic venturi. A star wheel performs the same function for fertilizer. Air blown by a centrifugal fan picks up and carries the material along a hose, around an elbow, and up a dimpled standpipe — an arrangement that disperses a mixture within the vertical pipe. Upon reaching the pipe's top, the seed and fertilizer are deflected by an inverted cone into manifold outlets connected to hoses leading to individual furrow openers. For example, seven 11-outlet manifolds are featured in hoe drillers with 7-in. row spacings. The delivery tube for each furrow opener is fitted with a piezoelectric flow sensor for detecting blockage. These sensors are part of a microprocessor-based monitoring system that keeps tabs on fan speed, grain and fertilizer shafts, bin levels, and an electric clutch (which engages the ground-driven metering system). Case-IH, Racine, WI.

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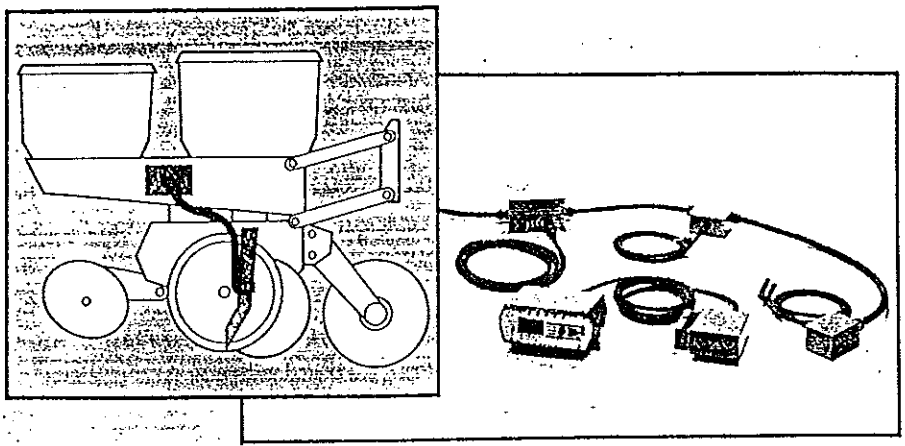
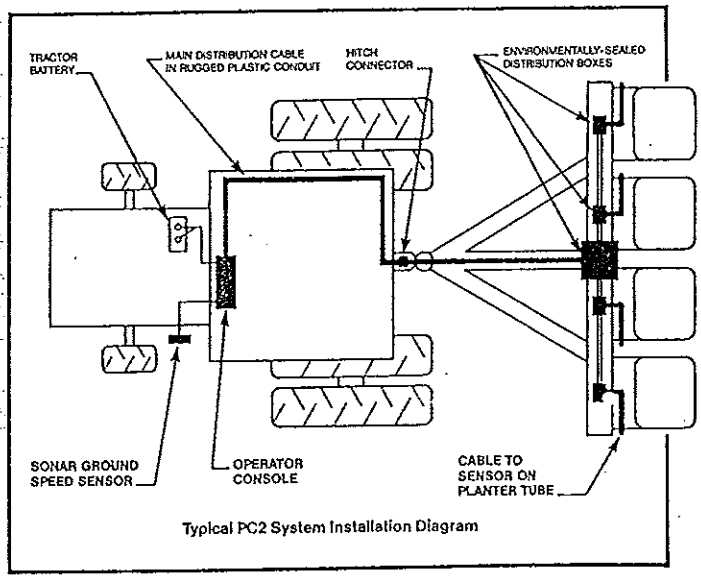
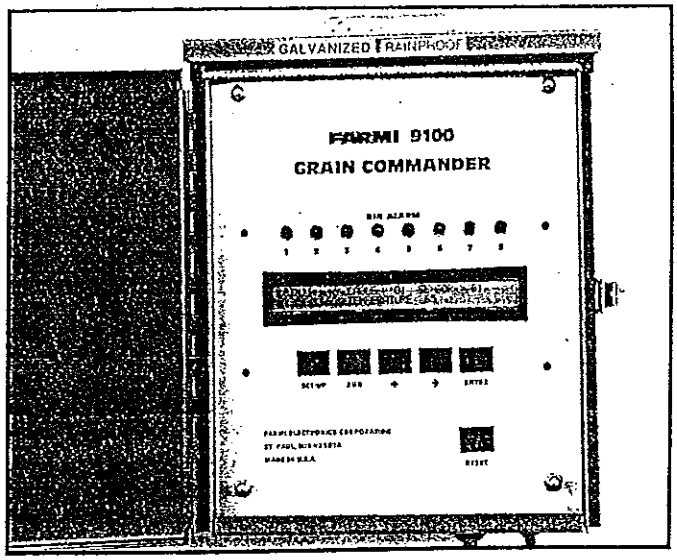


Clamp-On Sensors Detect Passing Seeds

Electromagnetic sensors enable a planter monitor to detect seeds ranging in size from uncoated celery to potato stock. Each sensor module consists of U-shaped frame that clamps on the outside of a planter drop tube. An electrical field is set up across the tube by feeding a low-power signal to the frame's opposing metal plates. The strength of this field is changed by the dielectric constant of a passing seed, thereby providing an event that can be detected and recorded by a microprocessor-based console. This second-generation design is teamed with a dual-beam sonar sensor for measuring the true ground speed. The PC2 Plant Computer then calculates and displays planting information according to operator-programmed data for row width and number of rows. A dual LCD/LED readout displays the data for row and total populations, field and total acres, acres per hour, seed spacing, true ground speed, and sensor activity. Compared with a photoelectric sensor, an electromagnetic device is claimed to be more accurate in detecting the passage of multiple seeds (such as soybeans), tracking high planting rates, and resisting the effects of sunlight, dust, seed coating, graphite, and vibration. Pioneer Technology Inc., Sunnyvale, CA.

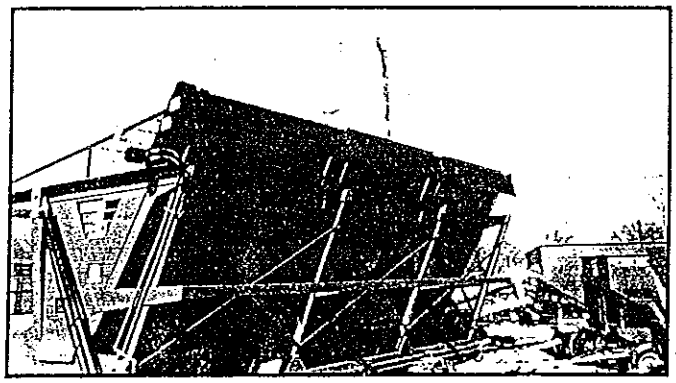


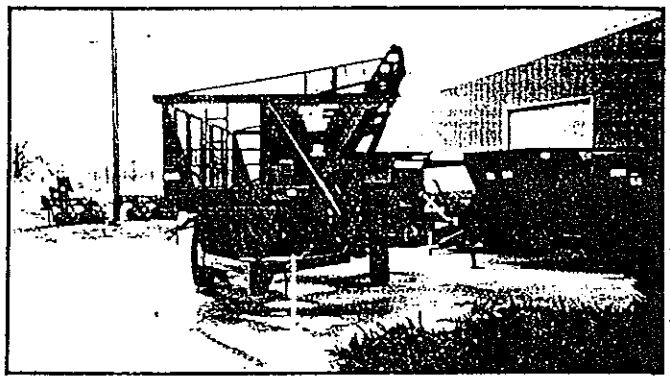
Typical PC2 System Installation Diagram

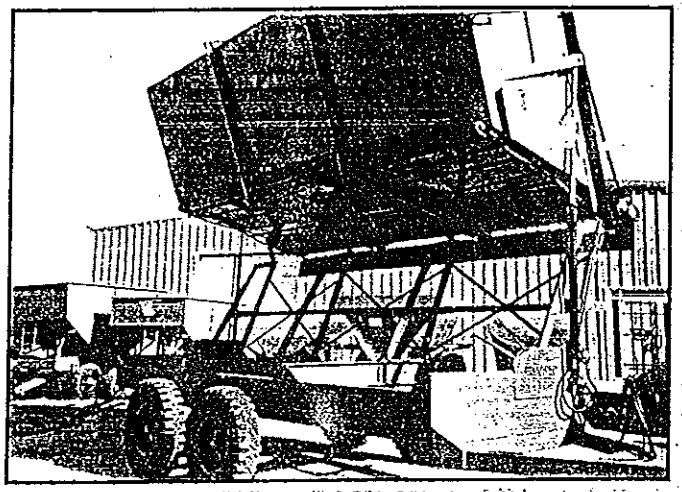


Grain-Tending Unit Controls Aeration

Grain monitors and aeration controls are key elements of a grain storage management system called the Farmi 9100 Grain Commander. In combining advanced microprocessor and control hardware with existing technology for sensing grain temperatures, the system is designed to maintain the quality of stored grain under short or long-term conditions. The fully programmed system can automatically turn on the aeration fans for any of up to eight different grain bins or silos. An elaborate network of sensors located in the bins is used to supply the information on grain temeperature. Other sensors feed in data on the relative humidity and ambient air temperature. The system also incorporates the grain equilibrium tables for eight different stored grains, reports Farmi Electronics Corp., St. Paul, MN.

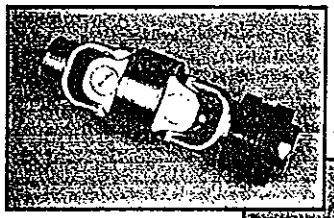


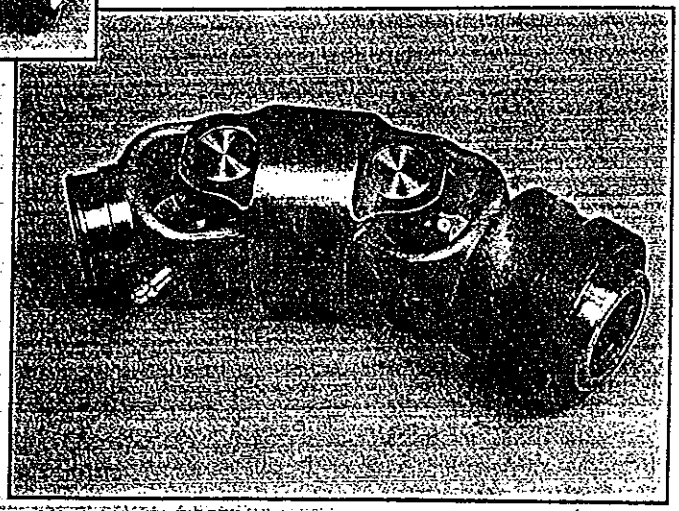




Side-Dumping Cart 'Meters' Out Cotton

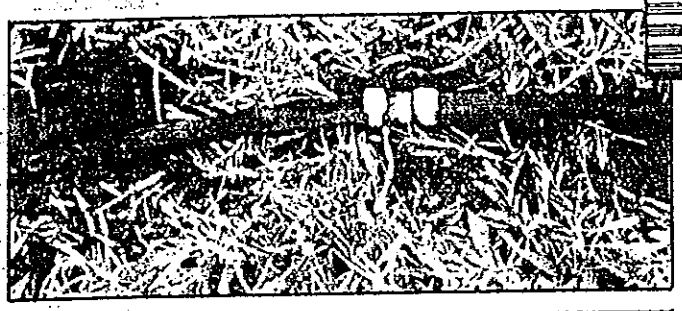
Two unloading options are featured in a side-dumping cart designed for transporting cotton from the picker to a module builder or a cotton trailer. Built for a dumping height of 11 ft, the cart can unload cotton solely by gravity or employ a chain-and-slot conveyor installed along one of its 20-ft long sides. A remote hydraulic motor drives the three-section conveyor, which can be operated while the cart is stationary or moving. The basket tilt and conveyor unload functions combine to provide a "metered dumping action" as the cart empties its 800 ft³ load into a module or trailer. This capability fosters even distribution and is considered especially useful when topping off a load. The Boll Buggy cart for cotton transport is built by the Tri-State Div. of United Farm Tools, West Memphis, AR.

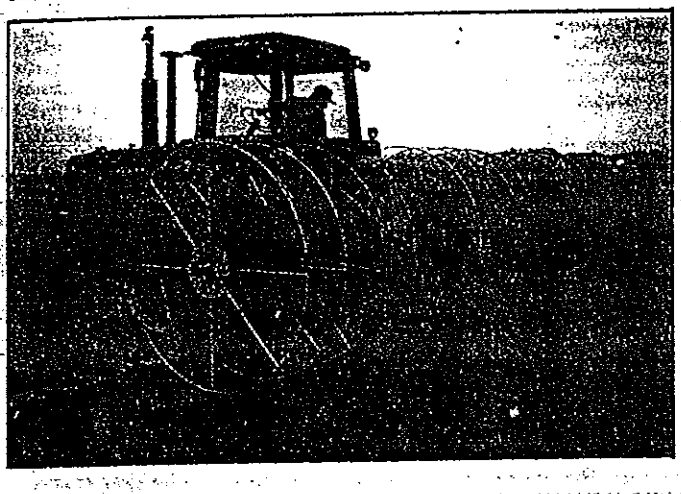




Compact CV Joint Allows 50-Deg Offset

Two back-to-back Cardan joints are featured in a compact coupling for agricultural drivelines. Linked together through a coupling yoke, the double-Cardan joint connects shafts that operate at offset angles up to 50 deg. In transmitting torque through an angle at constant velocity, the universal joint eliminates driveline oscillations that cause fluctuation in transmitted power. The compact, lightweight joint thus minimizes vibration and noise in the drivelines of equipment such as mowers, auger elevators, cotton pickers, and grain combines. Other features include a ball-and-socket design, telescoping splines, and options such as a friction clutch, over-running clutch, and shear devices. The 50-deg. CV joint is built in two sizes for dynamic torque ratings of 1,600 and 3,200 in.-lb. Weasler Engineering, West Bend, WI.



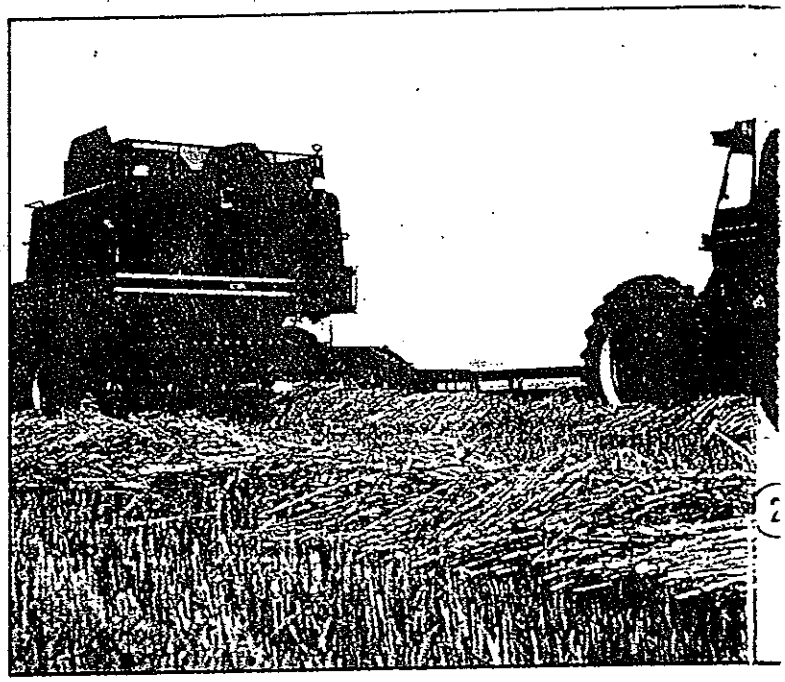


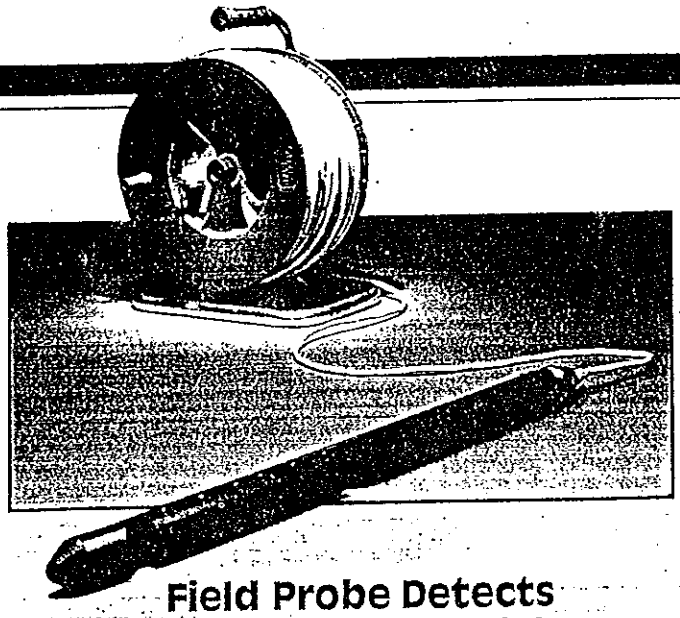
Buried Porous Tubing Emits Irrigation Water

Porous tubing made from recycled automobile tires is buried in the soil to provide subsurface irrigation lines for a variety of crops. Previously made in 3/8 and 5/8-in. sizes, the material called Leaky Pipe is now formulated with an 1/8-in. ID claimed to give the same watering capacity as earlier designs while reducing system cost. A porous rubber pipe functions much like a permeable membrane. Water admitted to the flexible pipe moves outward along a labyrinth of elastic channels, thus passing through the walls and forming sweat-like beads of water. This "sweating process" enables the full circumference and entire length of a pipe to serve as water-emitting surfaces for the low-volume, low-pressure irrigation system. The water can then travel through the soil by capillary action in the plant root zone. The pipe is buried to form an underground grid of lines located 3 to 5 ft apart. Entek Inc., Grapevine, TX.

Tractor-Based Processor Controls Towed Combine

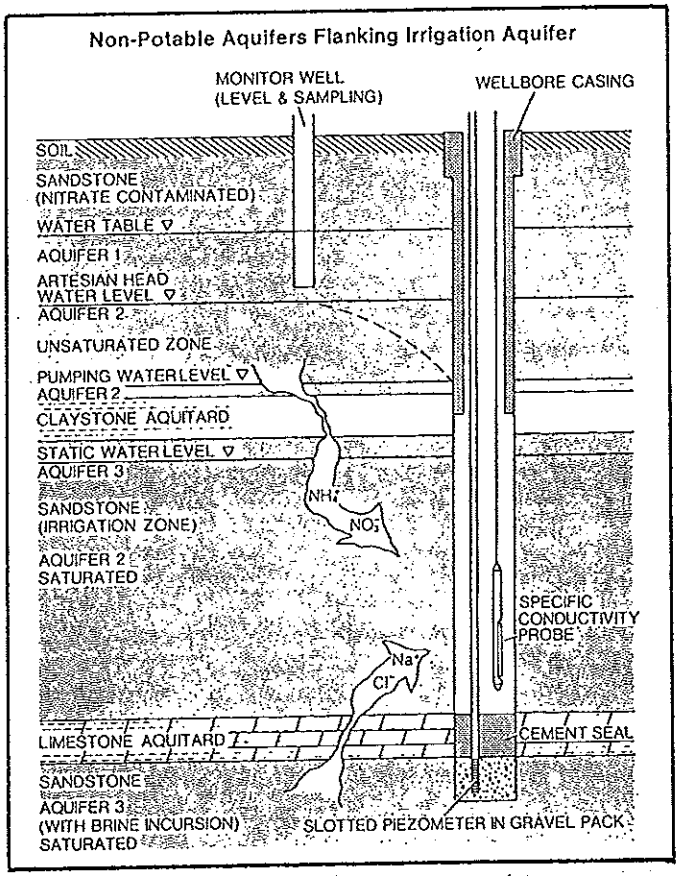
An 8-bit microprocessor is teamed with electronic devices to monitor and control a pull-type combine from inside the tractor cab. The control console for a model 1682 combine consists of a two-channel digital tachometer, seven-channel shaft-speed monitor, eight switches for combine functions, four switches for other functions, and an automatic/manual reel-speed control. Both audible and visual alarms are given whenever the setpoint speeds are not reached by shafts for the threshing/separating rotor, cleaning fan, shoe sieve, tailings elevator, clean grain elevator, straw chopper or beater, and feeder. Seven combine mechanisms controlled through the tractor-mounted console are the feeder clutch, unloader clutch, work lights, rotor-speed variator, cleaning fan-speed variator, automatic/manual windrow pickup (or reel-speed control), and feeder reverser. The console providing these capabilities has 12 membrane-type switches, one DPDT rocker switch, a rotary potentiometer, and an eight-character LCD display. Also featured are built-in diagnostic routines enabling the system to monitor 18 input and output circuits for malfunctions. This microprocessor-based system provides an operator with more accurate information about a combine than was previously available from a non-microprocessor based system, reports Case IH, Racine, WI.

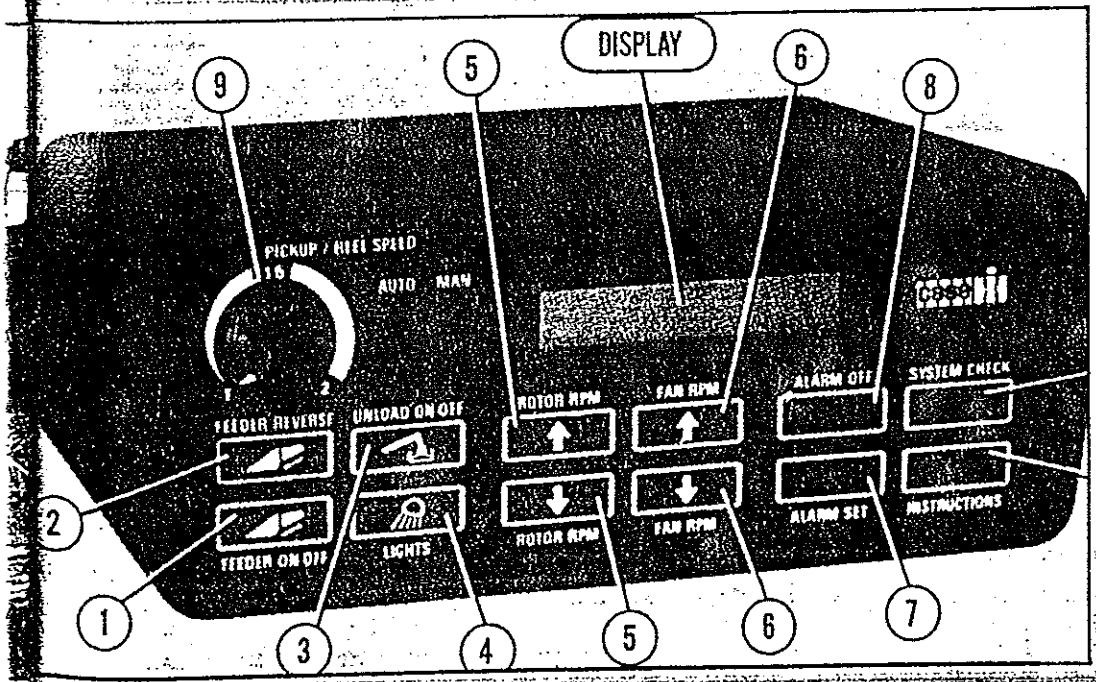




Field Probe Detects Specific Conductivity

Irrigation wells and ditches can be monitored with a field probe for specific conductivity, temperature, and salinity. Housed in a 1.7-in. diam urethane body, the probe permits access to monitoring wells with a 2-in. ID casing when sensing the quality characteristics of irrigation water (or other solution). The 27-in. long element is provided with two interchangeable resistors, which adapt the probe for low and high ranges of conductivity with a resolution of ±0.02. The signal-generating device connects to an electronic monitor via a cable ranging up to 1,500 ft long. All calibration is by software coefficients supplied with each unit. The temperature of the solution is displayed in addition to the uncompensated or compensated conductivity. In-Situ Inc., Laramie, WY.

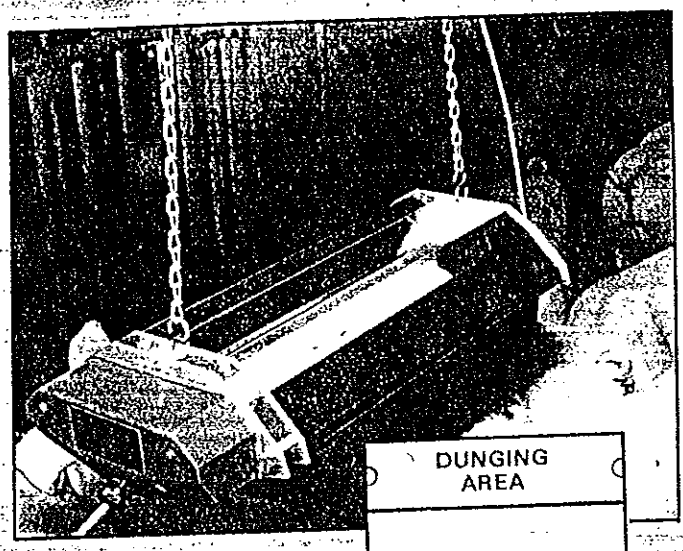


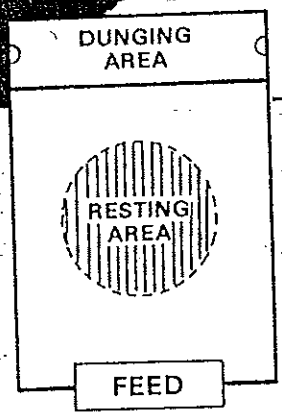


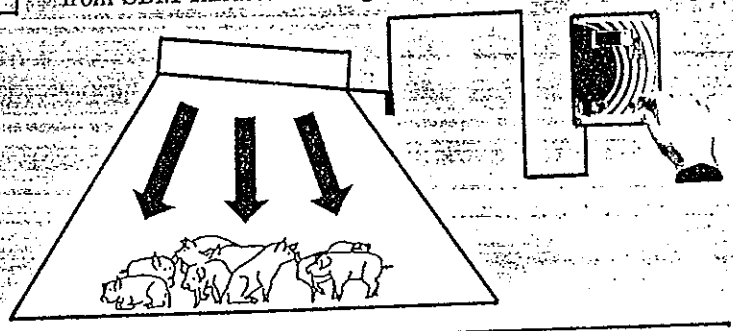
1. Feeder on-off
2. Feeder reverse
3. Unloader on-off
4. Lights on-off
5. Roster rpm
6. Fan rpm
7. Alarm set
8. Alarm off
9. Pickup reel-speed control
10. Systems check
11. Instructions

Ceramic Heaters Ease Pig-Weaning Stresses

An electric-powered infrared system replaces conventional space heaters for weaned pigs in nursery pens. The new heater consists of two ceramic bars housed in a double-body aluminum reflector. In creating a warm comfort zone for each pen, the infrared heater helps to establish a clean rest site away from the dunging, watering, and feeding areas. An electronic sensor continuously monitors within 0.1°F the radiant energy felt by the pigs. Both the sensor and heater are connected to a microprocessor-based controller in a closed-loop system for adjusting the thermal output. This arrangement helps to minimize weaning stresses by decreasing the temperatures from 88°F to 70°F as pigs grow from three to eight weeks of age. The Oscar heating system is available from SBM Infrared Heating Inc., Fredericksburg, VA.

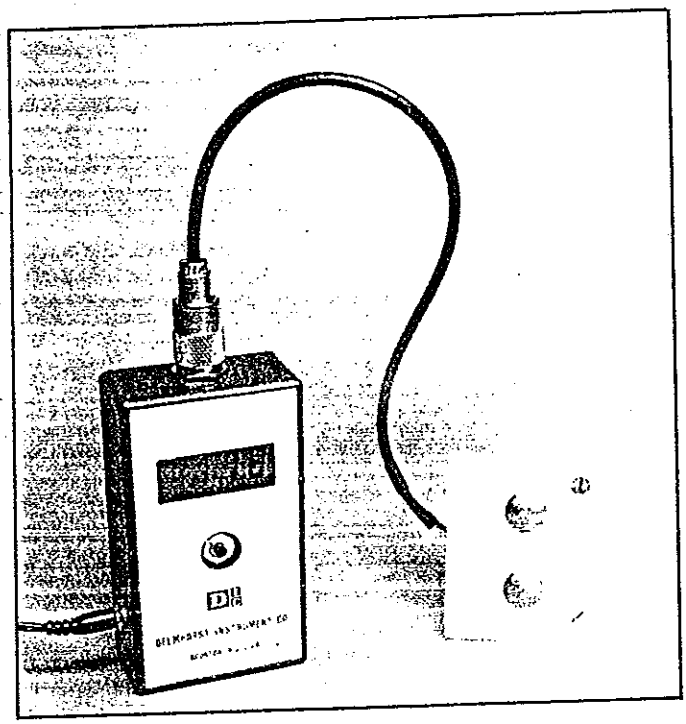






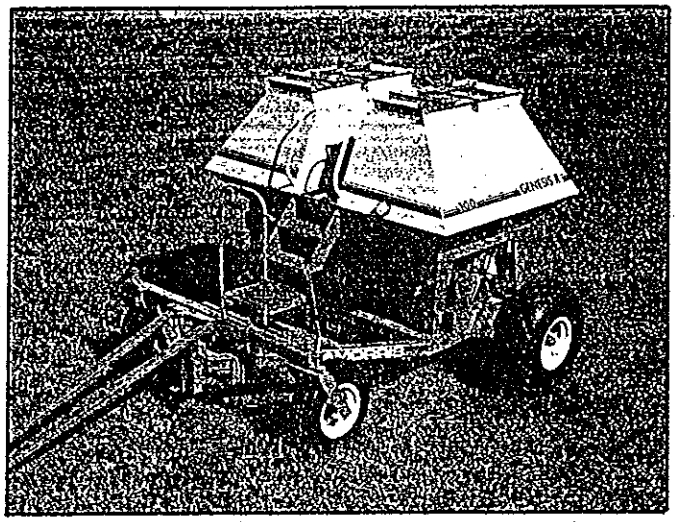
Baler-Mounted Sensor Tracks Moisture Levels

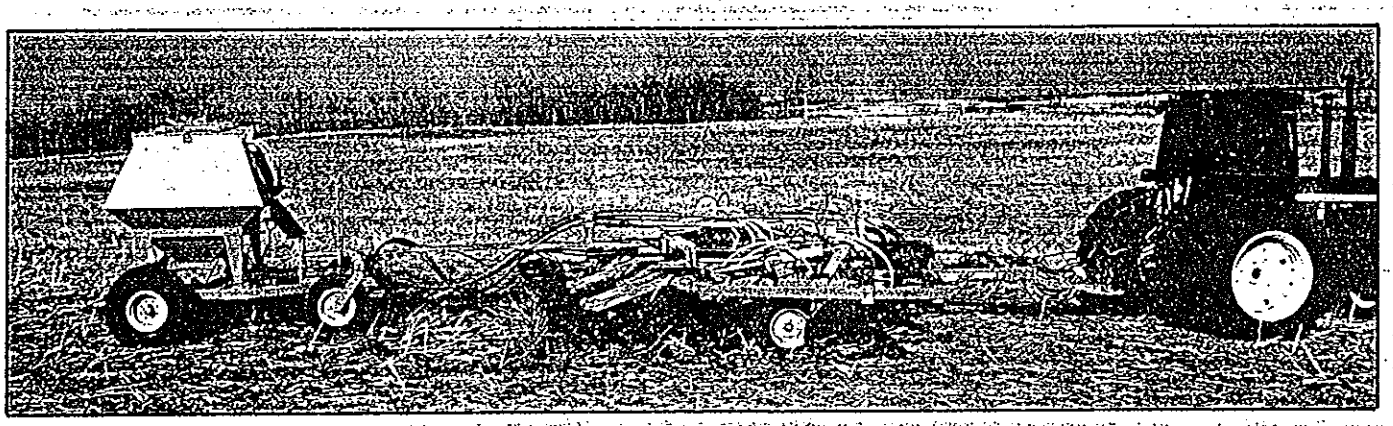
A baler-mounted sensor is teamed with a cab-installed meter to provide continuous readings of the hay's moisture content during baling. The sensor consists of two contacts embedded in a plastic plate that is mounted on the compression door or side rails of a bale chamber. A coaxial cable connects the sensor to an electronic meter located in the cab of a tractor or baler. This system monitors the moisture content of hay ranging from 13% to 40%. In addition, the instrument can be used as a conventional portable meter when detached and hooked to a battery power source. Delmhorst Instrument Co., Towaco, NJ.



Wheel/Cup Meters Aid Pneumatic Seeding

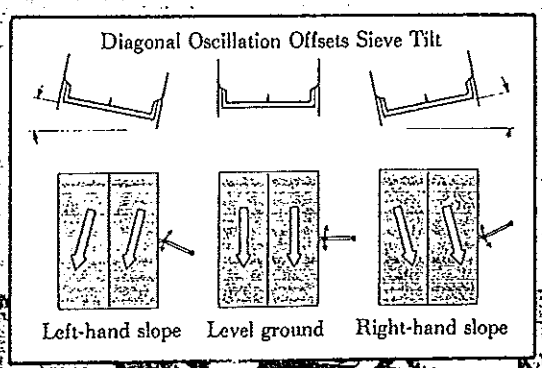
A two-part metering system transfers seeds and granular materials from supply tanks into the air-driven delivery tubes of seeders built by Morris Rod-Weeder Co. Ltd., Yorkton, Saskatchewan. Consisting of a pegged nylon wheel and an acetal metering cup, the new system is claimed to be as accurate as mechanisms in a conventional grain drill for handling a wide variety of seeds such as rape, mustard, and lentils. A pneumatic divider head is included to maintain distribution accuracy on sloping ground. The drive system for wheel/cup meters permits dispensing all of one product or up to four different products simultaneously. Thus, one-pass operation of the Genesis II-100 air seeder can distribute material to specific ground openers for the optimum placement of seed, fertilizer, and granular herbicide.

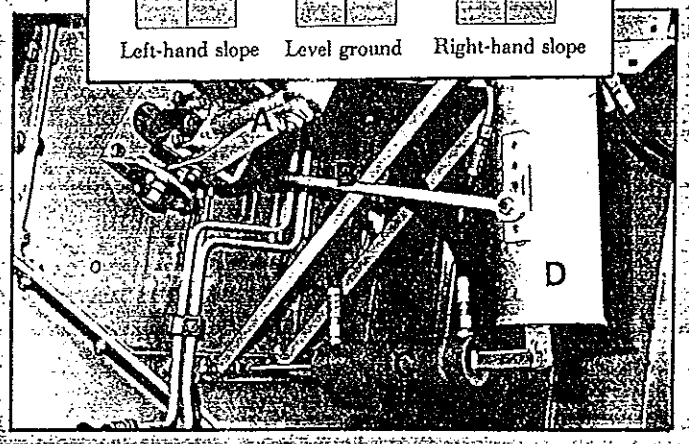


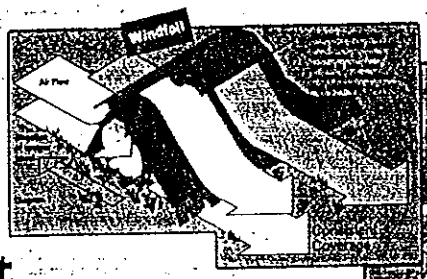


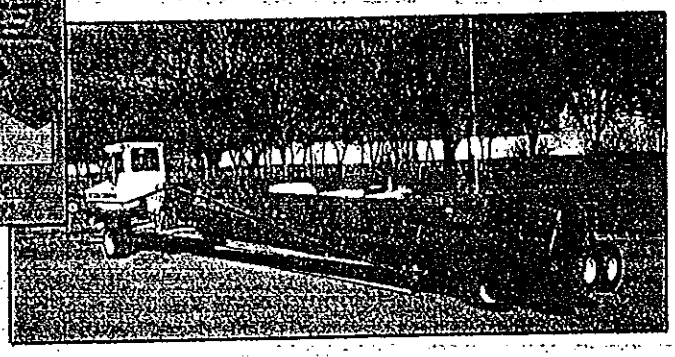
Self-Adjusting Link Controls Sieve Motion

A tilt-sensing hydraulic system adjusts the grain-distributing motions applied to a combine's cleaning sieve when operating on a slope. Conventional guide and drive elements make the sieve oscillate through basic back-and-forth and up-and-down motions. An additional sideways motion is created by a pivot arm connected to one side of the upper sieve. When set at different angles, the pivot arm imparts a diagonal vector to sieve oscillation that increases with ground slope. This arrangement for 3D motion control is claimed to maintain a uniform distribution of material over the full width of a grain-cleaning sieve. Heart of the control system is a pendulum sensor located inside a cannister (D). In response to combine tilt, the pendulum operates a spool valve regulating the flow of oil to a double-acting hydraulic cylinder (C). Extension or retraction of the cylinder realigns the cannister in a vertical orientation, thereby pulling or pushing an attached control rod (B). The rod moves a pivot arm assembly (A) that imparts the diagonal component to sieve oscillation. This design for dynamic slope compensation is included in several combines available from Claas of America Inc., Columbus, IN.



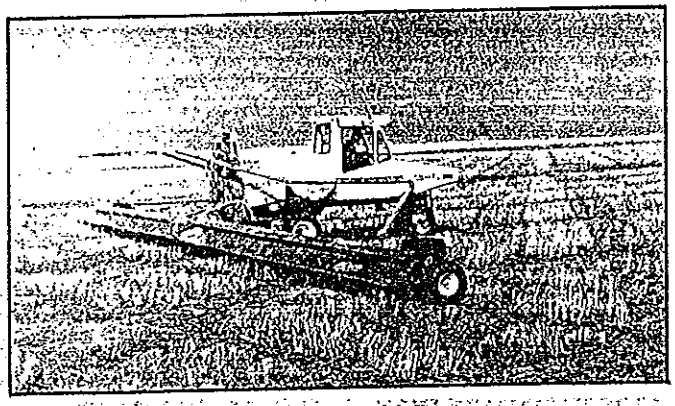


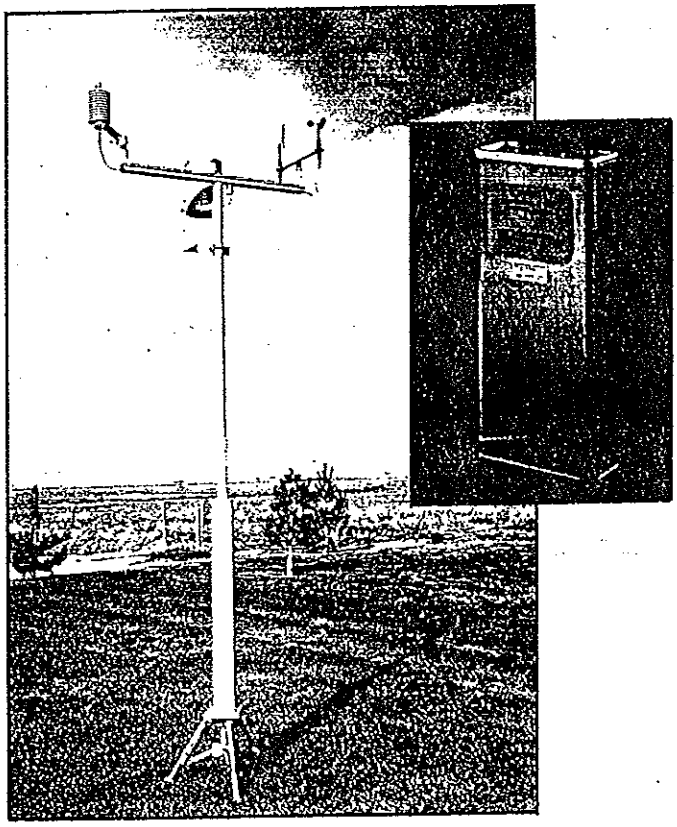




Self-Folding Rig Fosters Transport

An airfoil-topped shroud for sprayer booms reduces drift when applying chemicals under windy conditions. But the hover-like elements on wider booms can make it difficult to convert a rig for highway transport. A self-folding mechanism solves this problem by rotating the booms through 90 deg and letting the forward ends of radius rods move along a set of tracks or guide rails. The forward-tilting booms shift the sprayer onto transport wheels and unlock two radius rods. Tracks located along a vehicle's side let the arms slide rearward as a sprayer is pulled ahead, thereby folding the booms inward behind the vehicle. The sprayer is restored to its operating width when backed up in a field, causing the booms to separate as radius rods move forward along the track. Rotating the booms down and locking the rods into position completes the sequence. This arrangement enables an operator to convert a 50-ft sprayer to a 4-ft width without leaving the cab. Rogers Engineering Inc., Saskatoon, Saskatchewan.





Compact Unit Logs Environmental Data

Small data-logging instrument can be programmed for a wide variety of meteorology and hydrology studies. The CR10 is a microcomputer, clock, multimeter, calibrator, scanner, frequency counter, and controller — all packaged in a stainless steel cannister that fits inside a 4-in. diam pipe. The measurement and control module has a Hitachi 6303 processor, 32K ROM, and a 16K RAM (that is expandable to 64K). The unit accommodates 12 single-ended analog inputs, two pulse-counting inputs, and three switched excitation outputs. It also has eight digital I/O ports for on/off control or binary inputs. Sensor compatibility of the CR10 includes direct measurement of RIDs, metal foil strain gages, thermocouples, vibrating wire pressure and force transducers, and pulse-type signals (from magnetic AC flow meters, incremental encoders, photochopped or switch closure outputs). The CR10's standard internal memory stores 5,300 data values, expandable to 29,900. The data from multiple-station networks can be retrieved via phone, RF, or direct-wire links by using CR10-based software with IBM or compatible personal computers. A common application of the data-logging module is with an integrated weather station for monitoring solar radiation, wind speed and direction, air and soil temperatures, relative humidity, and precipitation. Campbell Scientific Inc., Logan, UT.