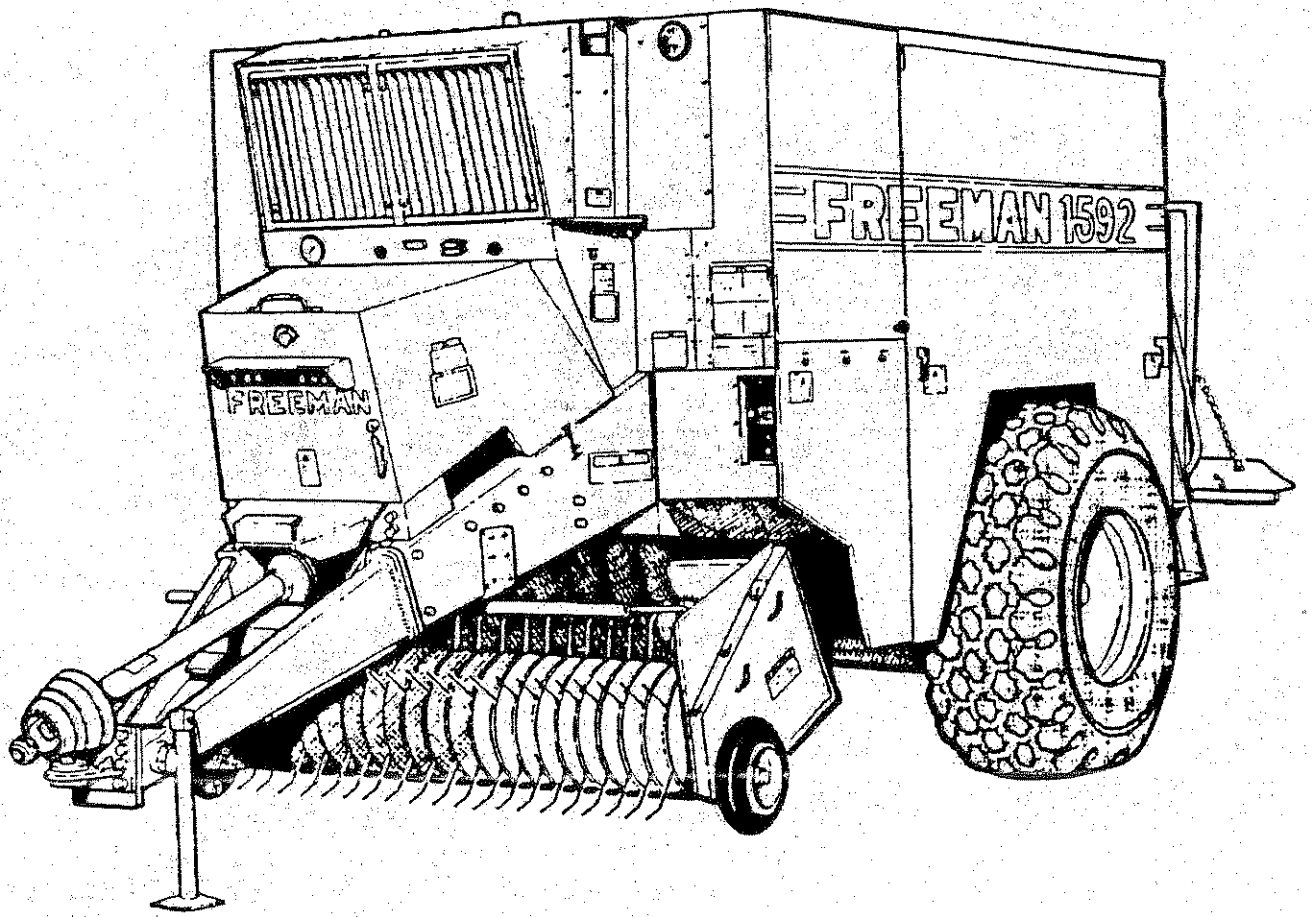
FREEMAN



ELECTRICAL AND HYDRAULIC INFORMATION AND TROUBLESHOOTING GUIDE

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INTENTIONALLY BLANK

FREEMAN MODEL 1592
BIG BALER

ELECTRICAL SYSTEMS GUIDE

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CONTENTS

SAFETY

1. SHUT OFF TRACTOR, DISENGAGE P.T.O., AND LOCK TRACTOR TRANSMISSION AND/OR BRAKES BEFORE ADJUSTING, LUBRICATING, CLEANING OR SERVICING THE BALER
2. KEEP HANDS, FEET AND CLOTHING AWAY FROM POWER DRIVEN PARTS.
3. AVOID WEARING LOOSE CLOTHING WHICH CAN EASILY BE CAUGHT IN MOVING PARTS.
4. USE APPROPRIATE SIGNS OR WARNING LIGHTS WHEN OPERATING ON PUBLIC ROAD WAYS.
5. MAKE CERTAIN EVERYONE IS CLEAR OF AND OFF THE BALER BEFORE OPERATING ANY PART OF THE MACHINE.
6. ALWAYS USE LIGHTS FOR NIGHT WORK.
7. KEEP ALL SHIELDS IN PLACE AND IN SERVICEABLE CONDITION.
8. DO NOT GO NEAR ANY EQUIPMENT UNTIL ALL MOVING PARTS ARE STOPPED.
9. DO NOT GO UNDER ANY RAISED COMPONENTS UNTIL THEY ARE SAFELY BLOCKED OR CHAINED IN POSITION.
10. AT ALL TIMES CARRY A 2A -10B FIRE EXTINGUISHER ON THE MACHINE
11. AT ALL TIMES KEEP THE MANYAL CONTROL CABLE IN A SAFE LOCATION AWAY FROM POWER DRIVEN PARTS.
12. REMEMBER SAFETY IS ONLY A WORD UNTIL IT IS PUT INTO PRACTICE.

BALER CONTROL CIRCUIT

The 1592 Big Baler Control Circuit consists of twelve limit switches, four relays and the necessary wiring to carry electric current from one point to the other. The limit switches serve to communicate the position of mechanical machine components to the control box. In the control box, electrical signals from the limit switches set or release relays which further direct electric current to actuate hydraulic components. The hydraulic components provide the power to place mechanical components into motion. Once a mechanical component is set in motion the limit switches communicate new information to the control box.

The information provided on the following pages is intended to assist the service personnel in understanding the various functions of the baler and the electrical circuits involved in their operation. Included in this section are basic circuit diagrams. These diagrams are illustrated to present information that will make it easier to use the full size drawings included with each baler.
The full size diagrams (blue print type) include information regarding location of components and where they connect at junction blocks and terminal blocks. To check an electrical circuit in question locate the active circuit using the shaded circuit diagrams in this manual. Refer to the full size diagram to identify points where voltage or continuity can be checked.

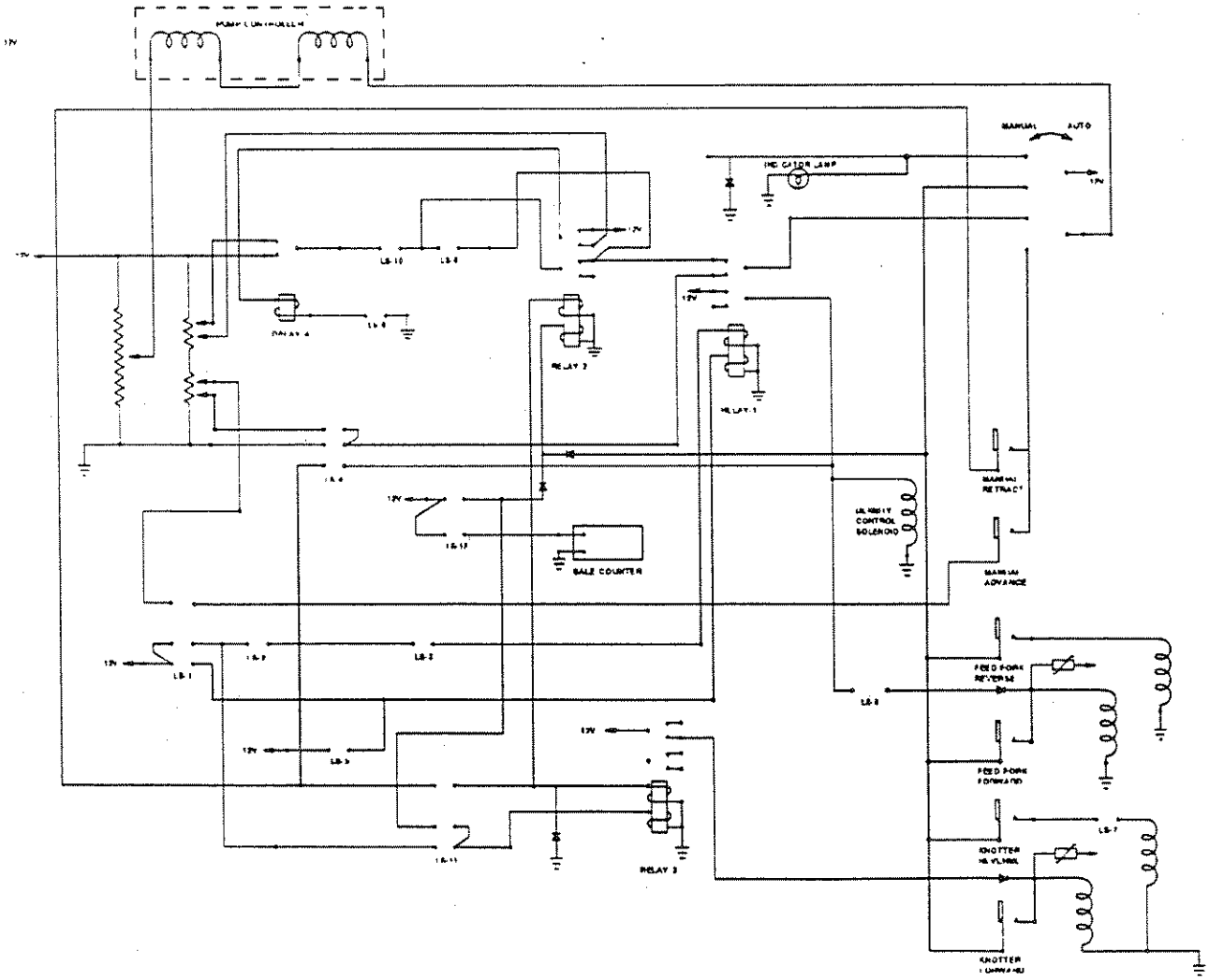


Fig. 1

ELECTRICAL COMPONENT LOCATION

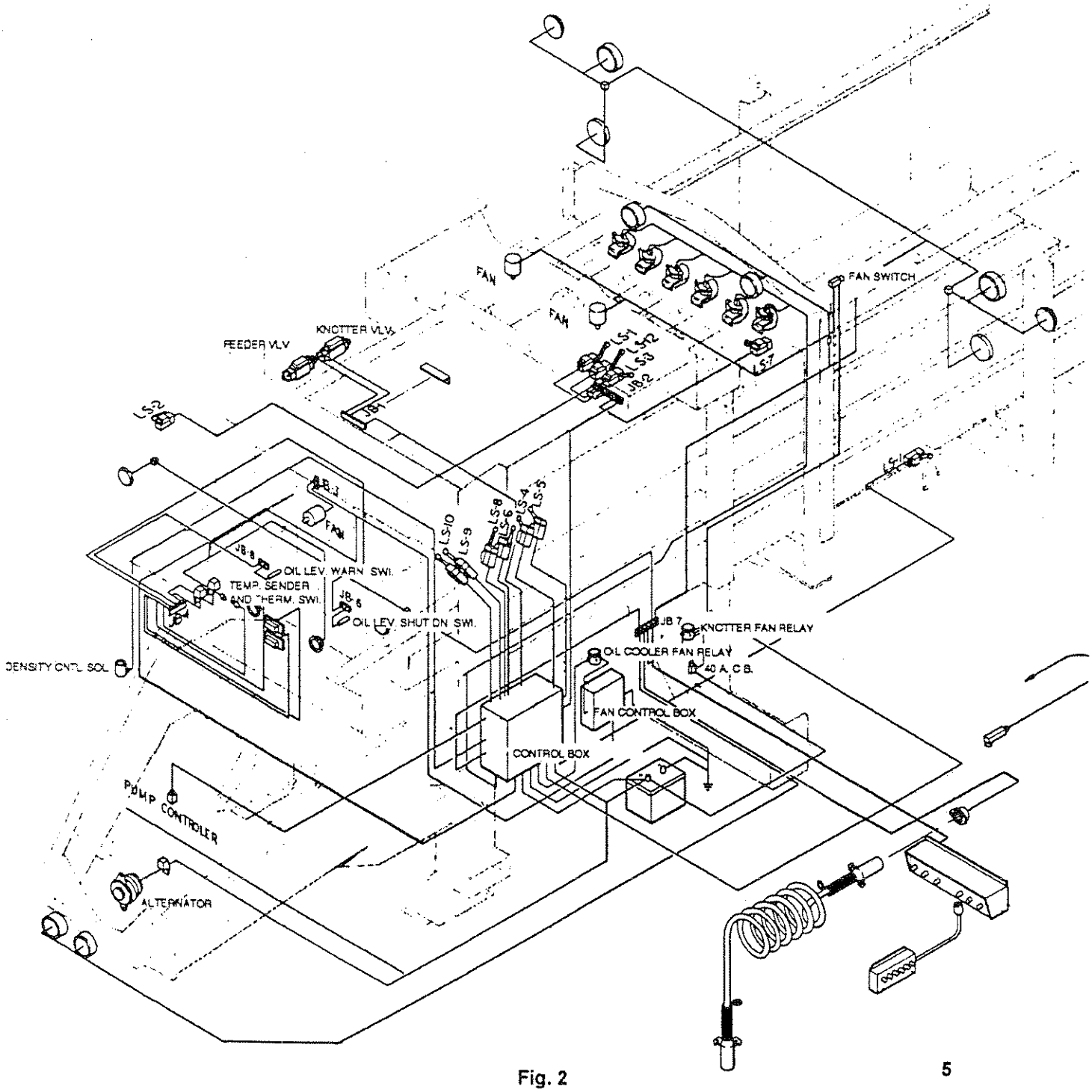


Fig. 2

LIMIT SWITCH INFORMATION

Limit Switches are Lever type with either four posts or eight. Standard symbols are used to represent these limit switches. **Fig. 3** illustrates a limit in the released position. The symbol for this position shows the switch as normally closed. **Fig. 4** shows the same switch as operated. The symbol is illustrated to show the open position.

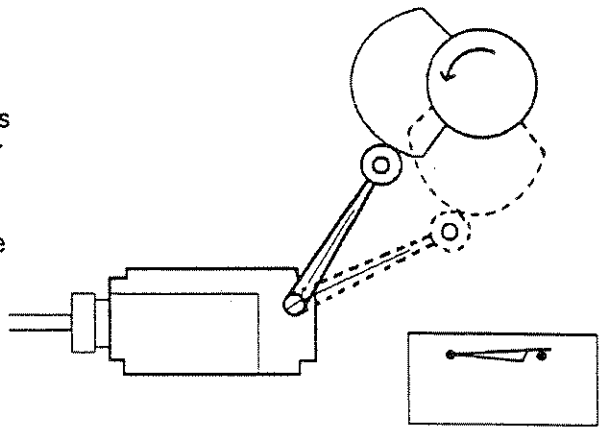


Fig. 3

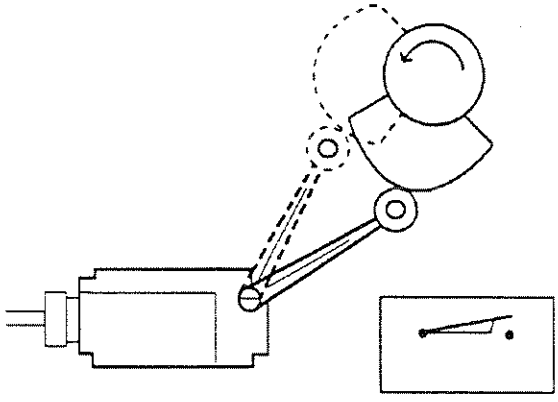


Fig. 4

Multiple Contact Switches

The limit switches used on the 1592 baler are multiple contact switches. Multiple contact switches may have both normally open and normally closed contacts. **Fig. 5** illustrates a symbol for a multiple contact switch. Each limit switch has a diagram of the contact positions on the body of the switch.

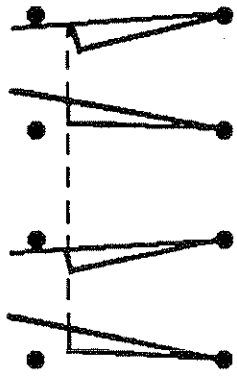


Fig. 5

LIMIT SWITCH DESCRIPTION

LS 1 "Knotter Stop / Plunger Safety Knotter Switch

LS 1 is operated by a cam mounted to the needle yoke drive shaft. When operated this switch tells the system that the needle yoke and knotter are in the home position. Another primary function is to stop the needle yoke in the rest position at the end of the tie cycle. For adjustment information see operators manual.

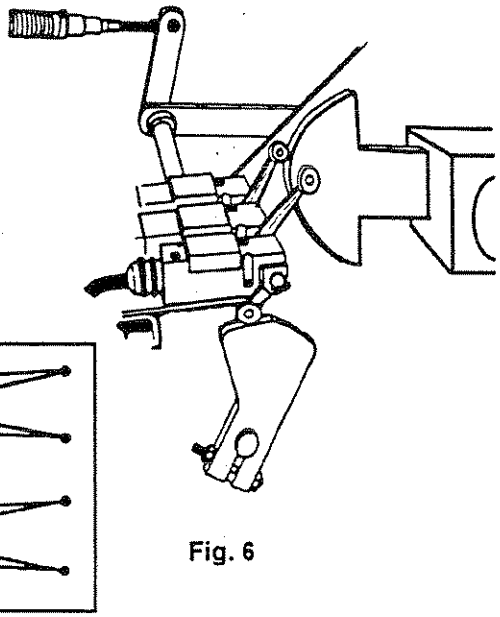
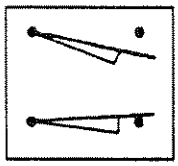


Fig. 6

LS 2 Plunger Delay / Feed Fork Switch

Limit Switch No. 2 is operated by a cam mounted to the Feed Fork drive sprocket. When operated this switch in combination with LS 3 allows current to set Relay 1. When set, Relay 1 cuts power to the Feed Fork. For adjustment information see operators manual.



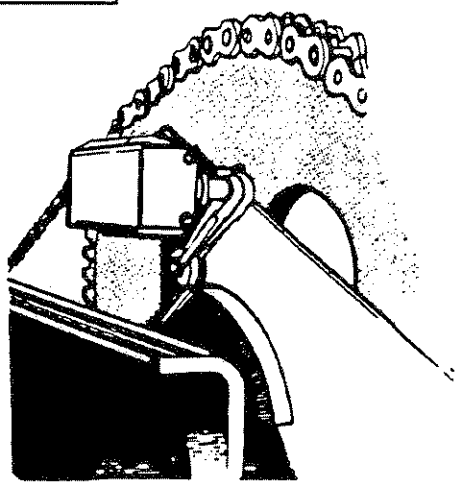
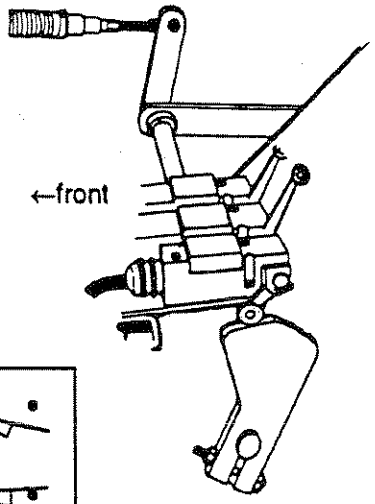


Fig. 7

LS 3 Full Charge Switch

Limit switch No. 3 is operated by a cam mounted to the feed sensor. When operated this switch in combination with LS 1 and LS 2 allows current to set Relay 1. When set, Relay 1 allows the plunger to advance For adjustment information see operators manual.



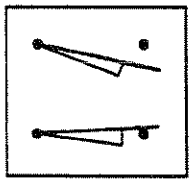
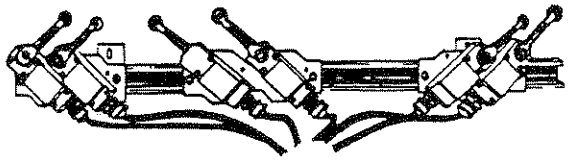


Fig. 8

LS 4 Plunger Advance Decelerate Switch

Limit Switch No. 4 is operated by the plunger near the end of the advance stroke. When released, this switch signals the main hydraulic system to operate in a decelerated mode. Another function of LS 4 is to close the circuit between Relay 1 and LS 11. For adjustment information see operators manual.



LS 5 Plunger Return Switch

Limit Switch No. 5 is operated by the plunger at the end of the advance stroke. When released this switch directs current to release Relay 1. With Relay 1 released the plunger can retract. For adjustment information see operators manual.

LS 6 Plunger Return Delay Switch

Limit Switch No. 6 is operated by the plunger shortly after the return stroke begins. During a tie cycle LS 6 stops the plunger on the return stroke if the knotter has not completed more then half of it's cycle. For adjustment information see operators manual.

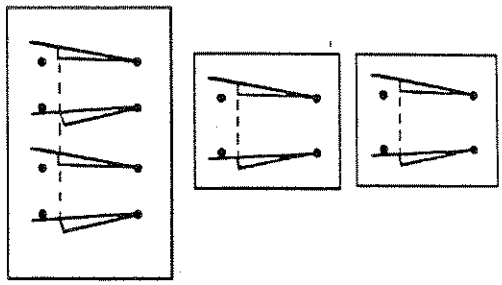


Fig. 9

LS 7 Knotter Reverse Safety Switch

Limit Switch No. 7 prevents the knotter from being rotated in reverse at a certain point during manual operation. A cam mounted on the knotter drive sprocket operates the switch. For adjustment information see operators manual.

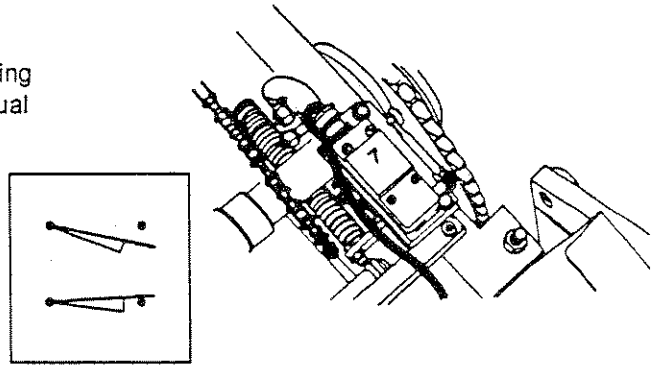


Fig. 10

LS 8 Feed Fork Delay Plunger Switch

Limit Switch No. 8 is operated by the plunger approximately half way through the return stroke. This allows the feed fork to start operating before the plunger has returned.

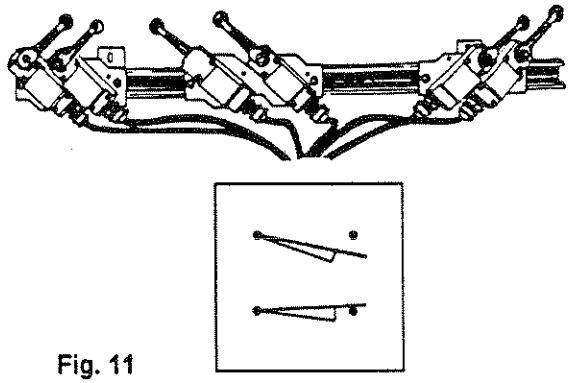


Fig. 11

LS 9 Plunger Return Decelerate Switch

Limit Switch No. 9 is operated by the plunger near the end of the return stroke. When operated LS 9 sets Relay 4 which causes the plunger to continue it's retract in a decelerated mode. For adjustment information see operators manual.

LS 10 Plunger Return Stop Switch

Limit Switch No. 10 is operated by the plunger at the end of the return stroke. When operated this switch cuts off current to stop the plunger. For adjustment information see operators manual.

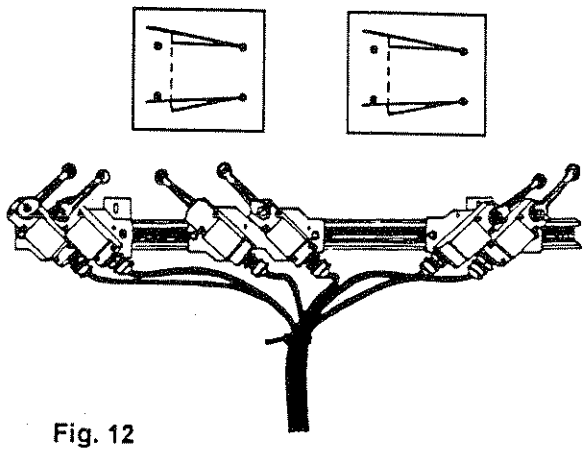


Fig. 12

LS 11 Knotter Trip Switch

Limit Switch No. 11 is operated by the meter arm. This switch allows current to reach Relay 3. When set, Relay 3 provides current begin a tie cycle. For adjustment information see operators manual.

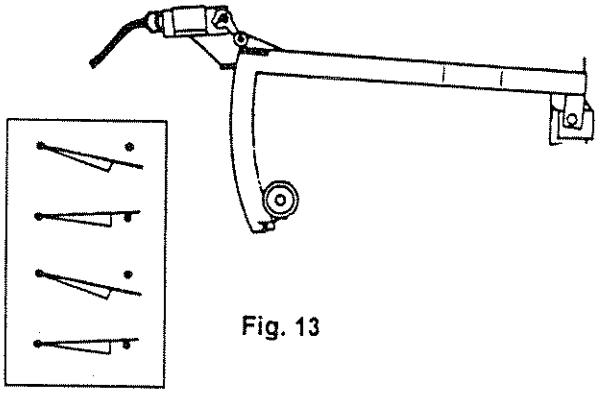


Fig. 13

LS 12 Plunger Early Start Knotter Switch

Limit Switch No. 12 is operated by a cam Mounted to the needle yoke drive shaft. When operated this switch allows the plunger to continue to return during a tie cycle without stopping at LS 6. Another function of LS 12 is to signal the bale counter.

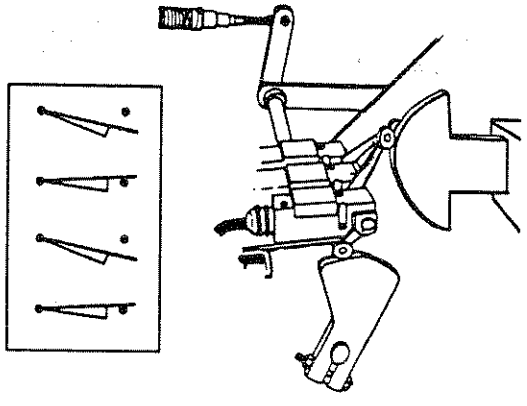


fig. 14

RELAYS

Relays are standard and magnetic latching type. A standard relay is set only when current is applied to the magnetic coil. **Fig 15** illustrates a standard relay in the set position (voltage applied). Each relay is contained in a plastic body **(Fig.16) that** plugs in to the control panel, (Fig.18).

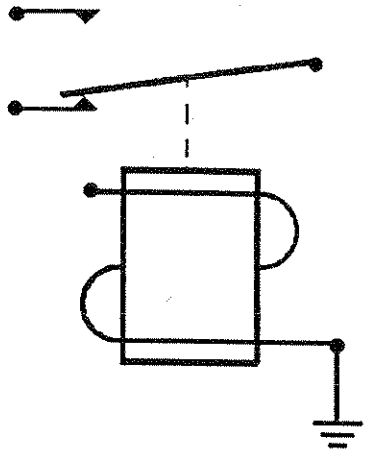


Fig. 15

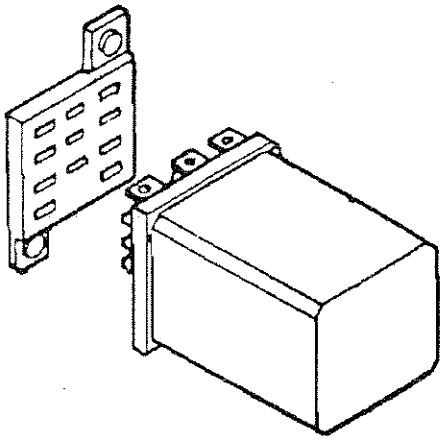


Fig. 16

MAGNETIC LATCHING RELAY

A magnetic latching relay requires current to set and release the relay. If no current is applied to a magnetic latching relay the contacts stay in the last position. If current is applied to both the set and released sides of the relay at the same time the contacts will favor the set position. **Fig.17** illustrates the magnetic latching relay and the symbol used to represent it. The dotted lines drawn between the coil and the contacts represent a mechanical link between the contacts.

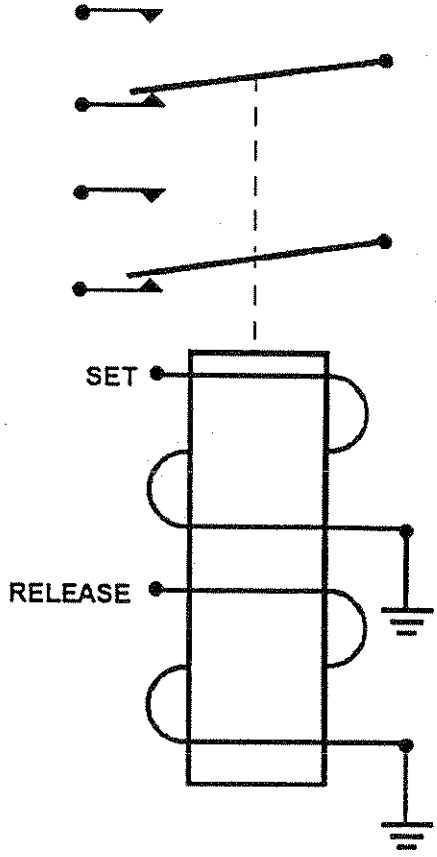


Fig. 17

MAIN CONTROL BOX

The main control box provides a central location for housing relays, switches, resistors and other electrical components that control the various functions of the baler. Three circuit breakers and one fuse protect the electrical components. **Fig. 18** shows a view of the control boxes internal components.

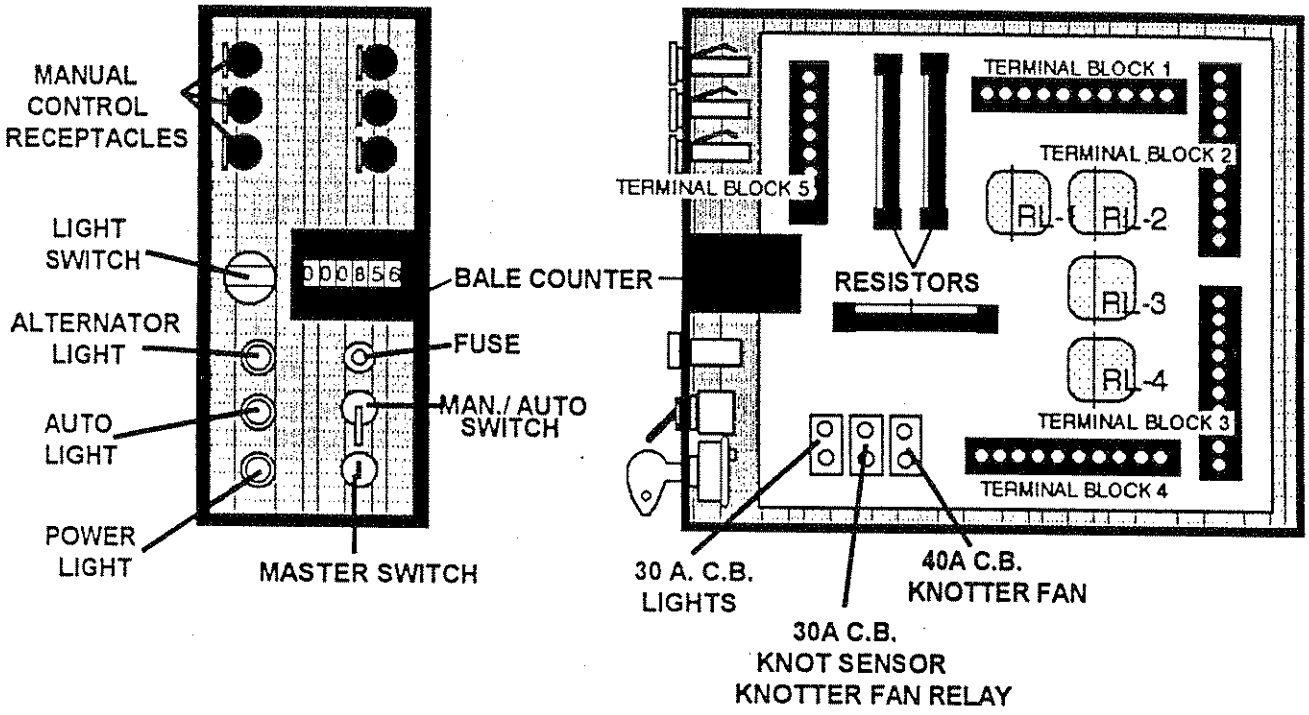


Fig. 18

RESISTORS

Three resistors are located in the main control box. These resistors control electric current to the Main Pump controller. The horizontally mounted resistor has a 200 ohm value. This resistor provides the primary resistance in the circuit. The vertically mounted resistors each have a 100 omh value. They regulate voltage during the decelerated modes of operation. Sliding contacts on each resistor **(Fig. 19)** allow for the adjustment of voltage that operates the controller .For proper adjustment of the voltage applied to the controller see "Plunger Speed Adjustment" in the operators manual.

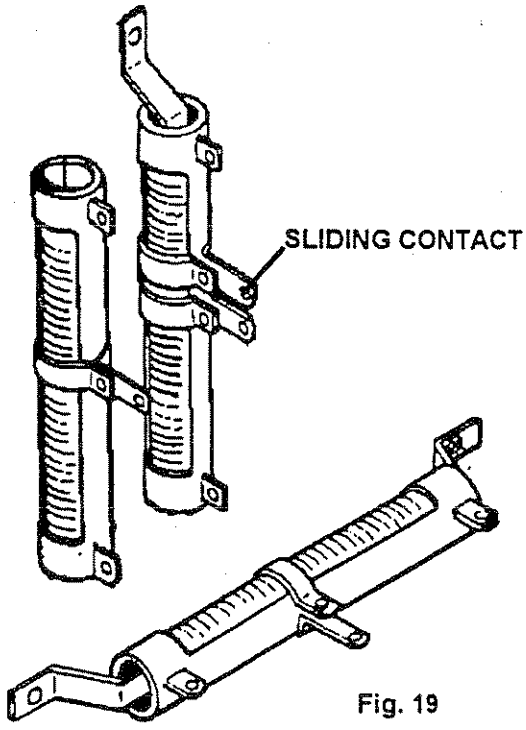


Fig. 19

SWITCHES

Switches located in the control box: (Fig. **18**)

A keyed rotating on/off switch for the control functions of the baler,
A toggle type selector switch for Manual or Auto operation.
A two position on/off light switch to control work lights for nighttime baling.
Six phone jack type receptor sockets allow use of a remote push-button switch to activate baler components manually. This switch is reffered to as the Manual Control Pendant.

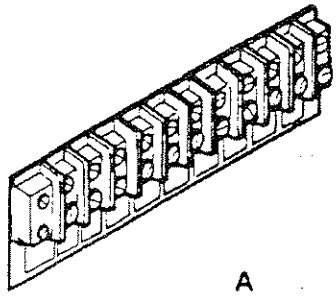
Switches on the baler

A two position on/off switch near the service ladder controls the knotter fans.
Work lights over the pickup and the knotters have toggle switches.

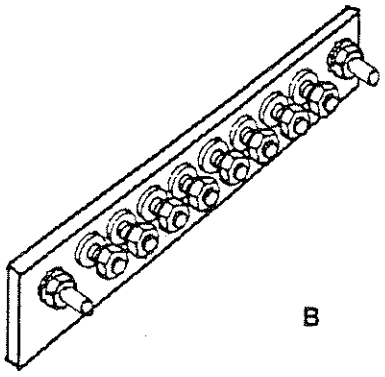
TERMINAL BLOCKS / JUNCTION BLOCKS

Terminal Blocks **(Fig. 20, A)** provide a point to connect the various wire harness' to the control panel. The Main Schematic has points identified as TB 1, TB 2 and so on. These designated points on the schematic relate to points in the control box where the circuit is joined at a terminal block.

Junction blocks **(Fig. 20, B)** are located throughout the baler and provide a place for harnesses to come together to join the various components. Junction blocks are referred to as JB 1, JB 2 and so on. On the Main Schematic these points can be identified and on the baler itself utilized for test purposes such as checking voltage.



A



B

Fig. 20

SOLENIODS

Wire wound soleniod coils are used as actuators on hydraulic components.
The Feed Fork and the Knotter control valves are activated by solenoids.
The Main Pump is controlled by a solenoid.
The Density control valve is open or closed by a solenoid.

SENDING UNITS

Oil temperature is monitored at the oil reservoir by four components.

1. A thermostatic switch allows current to reach the control circuit. **Oil temperature above 220 f. opens the circuit causing the baler to shut down.**
2. A float type oil level switch is connected in series with the thermostatic switch. **The power to the control circuit is disconnected if a low oil condition exists.**
3. A second float type oil level switch monitors oil level and causes the amber light to illuminate.
4. A sending unit provides a variable output to the temperature gauge.

CHARGING SYSTEM

Electrical current for the 1592 Big Baler is provided by a standard automotive type 12 volt battery located on the left hand side near the control box. Voltage is maintained by a 140 amp automotive type alternator mounted on the main drive unit. Operating voltage is internally regulated at 14.5 volts. The charging circuit is illustrated in **Fig. 22, Sec. A.**

FAN OPERATION

During the baling process heat is created in the hydraulic system. This heat must be controlled to assure the hydraulic oil retains it's power transmitting and lubricating properties. While the baler is operating, oil is circulated through a heat exchanger. An electric cooling fan circulates air across the heat exchanger anytime the main switch is on. A sequencer allows the fan motor to reverse every few minutes to dislodge foreign material from the heat exchanger cover screen. The fan will operate for five minutes in a forward direction to draw air through the heat exchanger. The sequencer disconnects power to the fan motor for 30 seconds to allow the fan to stop rotating. Power is then supplied to operate the motor in reverse for 30 seconds. Again power is disconnected for 30 seconds to allow the fan to stop rotating. The fan starts again and operates in a forward direction for five minutes. This cycle is repeated as long as the main switch is on. The electrical circuit is illustrated in **Fig. 22, Sec. C.**

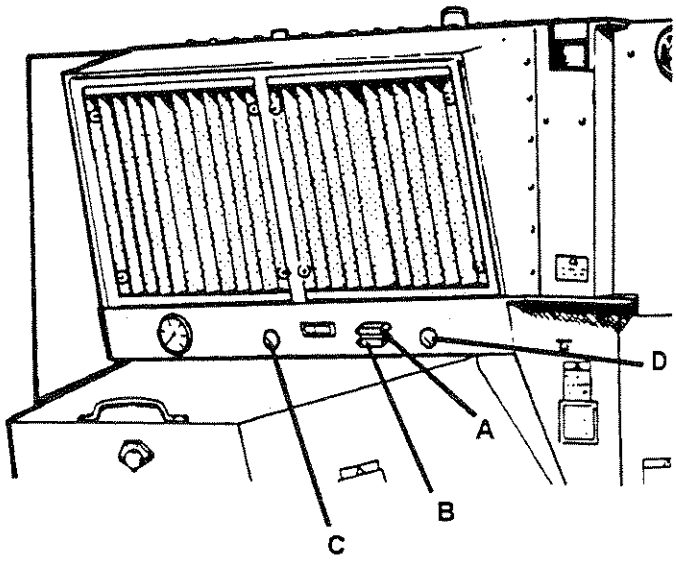


Fig. 21

WARNING LIGHTS

Two lights on the gauge panel **(Fig. 21)** alert the operator should problems occur with the condition of the oil. An amber light **(A)** will illuminate if the oil level becomes low. Flickering of the amber light is normal during operation of the baler due to wave action in the oil reservoir. The red light **(B)** illuminates when the oil level falls below safe levels or when oil temperature exceeds 220 f.

Shutdown of the baler control circuit occurs simultaneously with illumination of the red warning light.

The Cooling circuit remains functional allowing fan operation to cool the oil. A third light on the gauge panel illuminates if the alternator is not charging. The electrical circuits are illustrated in **Fig. 22, Sec B.**

GAUGES

A temperature gauge **(C)** monitors oil temperature by means of a sending unit mounted in the oil reservoir. A volt meter **(D)** indicates voltage available to the baler control circuit and the cooling circuit. The electrical circuit is illustrated in **Fig. 22, Sec B.**

POWER SUPPLY, MONITORING AND CONDITIONING CIRCUIT

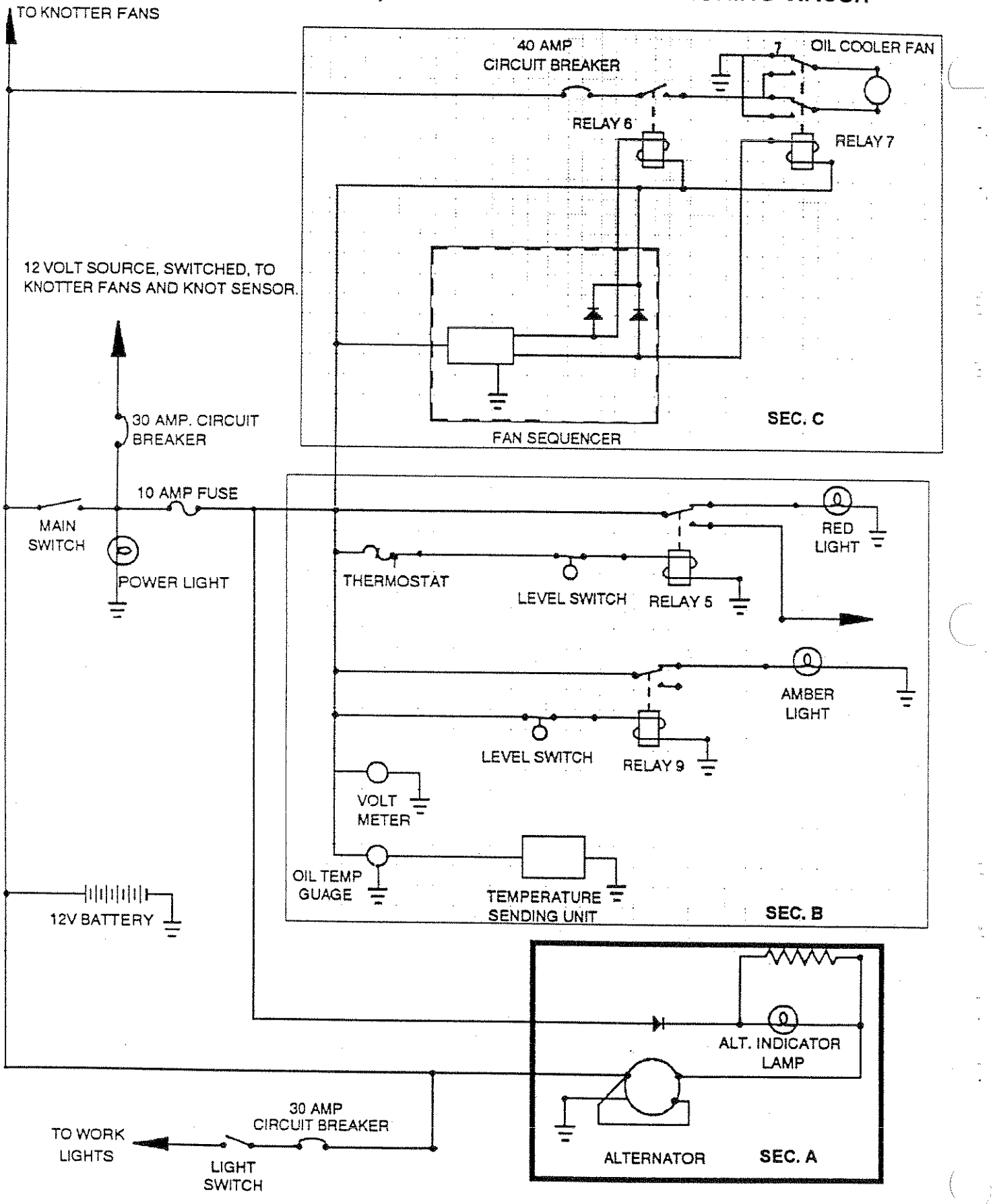


Fig. 22

KNOT SENSORS

The Knot Sensor system has six indicator lights which receive current from the main switch. Each time a bale is tied, a switch on each of the knot sensors are closed completing the circuit and causing the indicator lights to illuminate. As the bale is pushed through the chamber a securely tied knot will trip the knot sensor mechanism and open the circuit causing the light to go out. A remote indicator box is connected in series for use in the tractor cab. A 30 amp. circuit breaker protects the Knot sensor circuit.

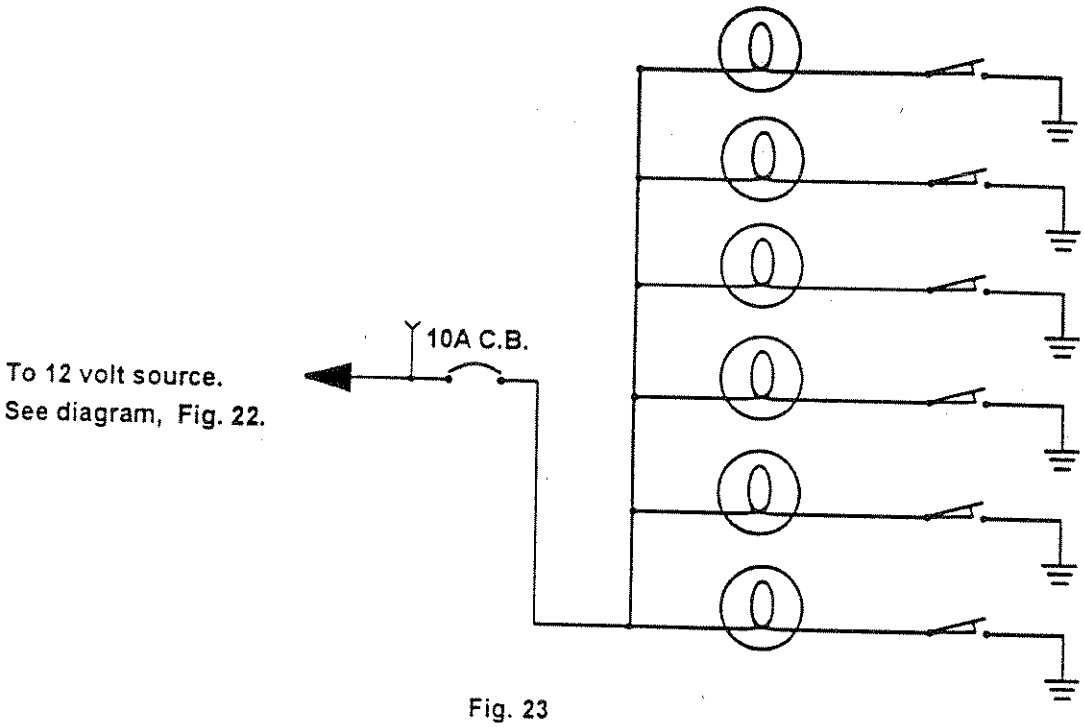


Fig. 23

KNOTTER FANS

Knotter Fans are powered by two 12v electric motors. Current is supplied direct from the battery to a relay. Current from the main switch activates the relay which allows current to flow to a switch near the knotters and on to the fans. The relay circuit is protected by a 30 amp. circuit breaker shared with the knot sensor circuit. The fan circuit is protected by a 40 amp. circuit breaker

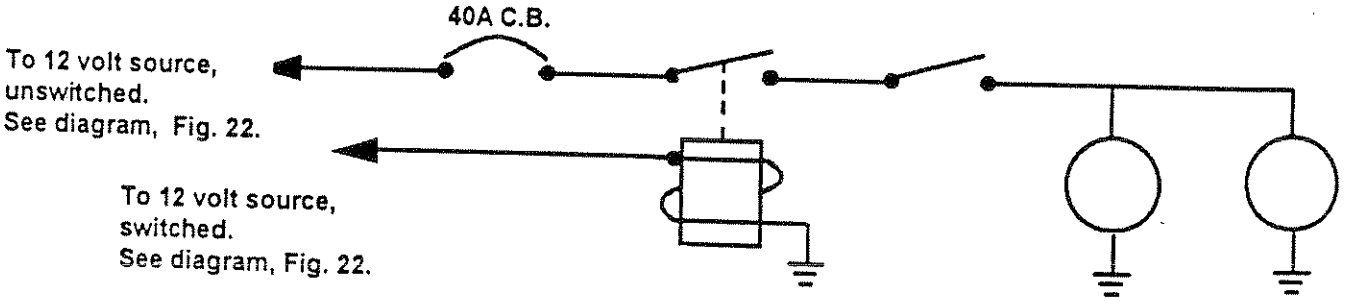


Fig. 24

LIGHTING SYSTEM

Two separate lighting systems provide illumination for nightime baling and for daytime travel on public roadways. The work lights recieve current from the baler electrical system. A switch on the Main Control Box controls these work lights. Stop, Tail, Turn and Hazard lights recieve current via a trailer harness connected to the tractor.

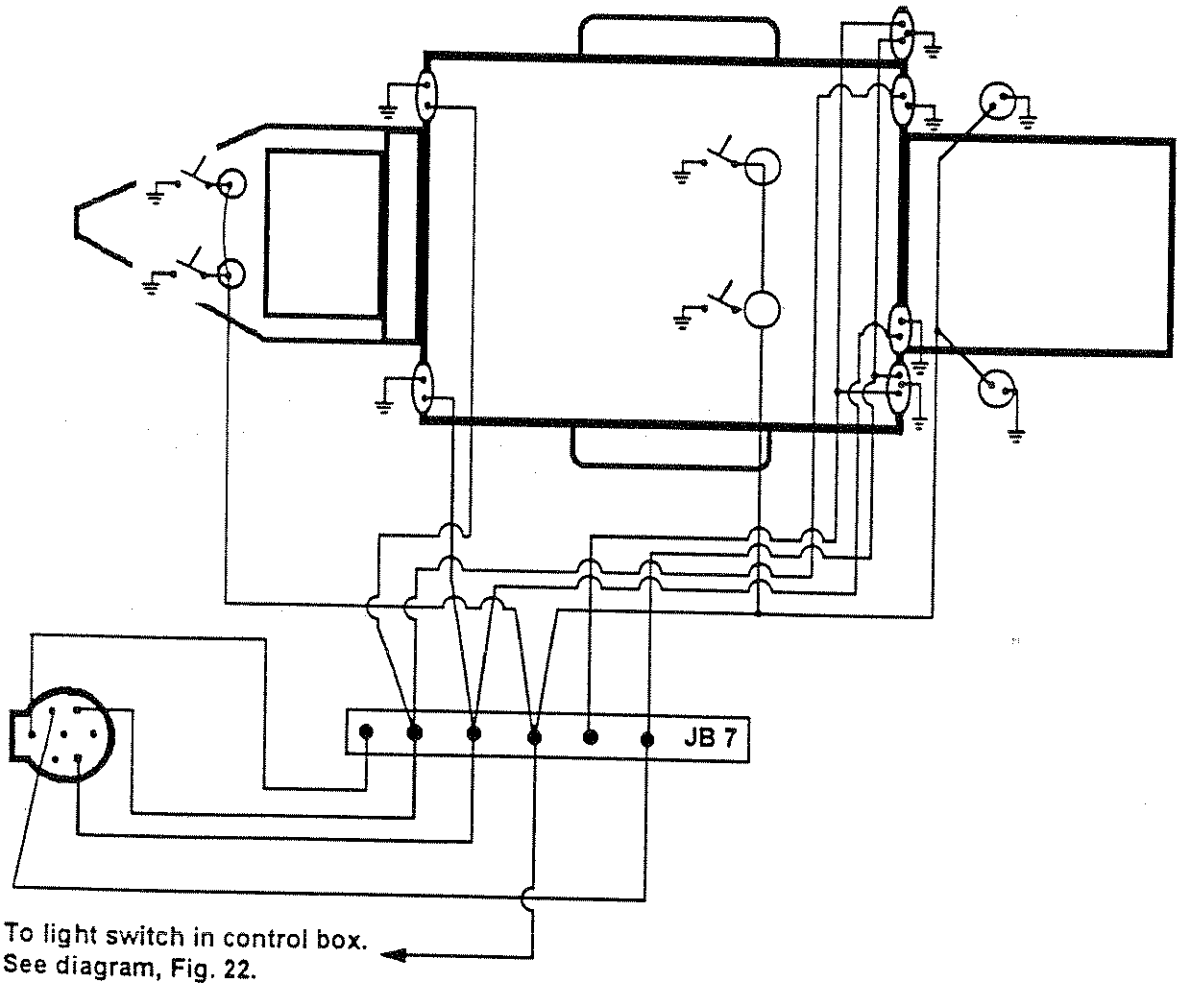


Fig. 25

CIRCUIT ACTIVETY DURING BALER OPERATION IN AUTOMATIC MODE

The following material has been assembled to provide an easy to read guide of the active electrical circuits as they are involved with each step of the baler's operation. Text on each page describes the function that is occurring. An illustration is provided to give a visual reference of the machine components and their positions during operation. A schematic combines with the text and illustration to show the active electrical circuit as it appears on the schematic. Use this section in combination with the full size schematic provided with this manual. The full size schematic provides location information regarding circuit test points.
Active circuits are shown with a shaded line. Shading is used to highlight circuits only. Their is no representation of voltage or current values intended.

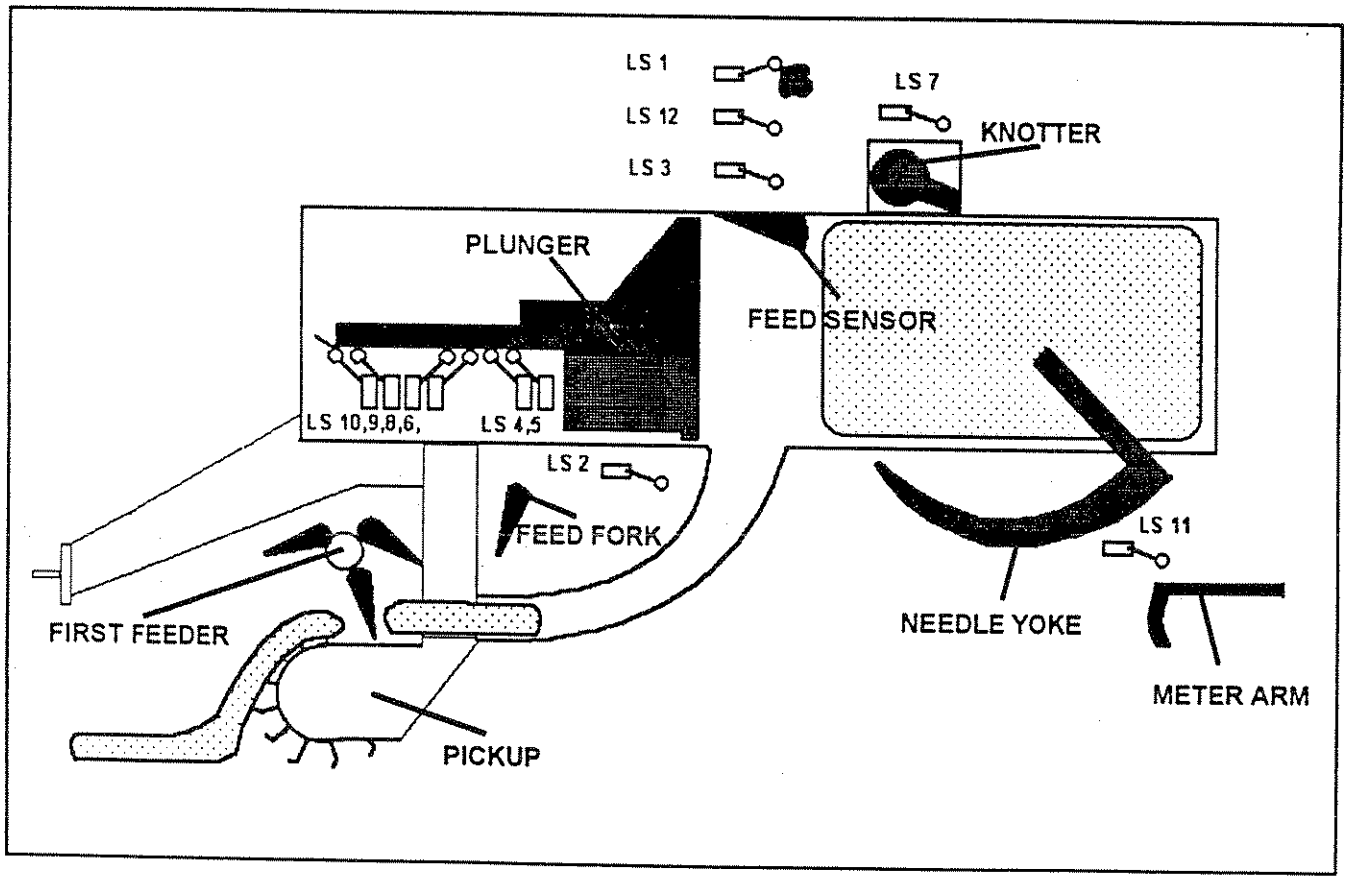


Fig. 26

ELECTRICAL SEQUENCE OF PLUNGER STROKE

The sequence begins with the plunger in the home position. The needle yoke must also be in the home position. This places LS 1 in operated condition to provide voltage to LS 2.

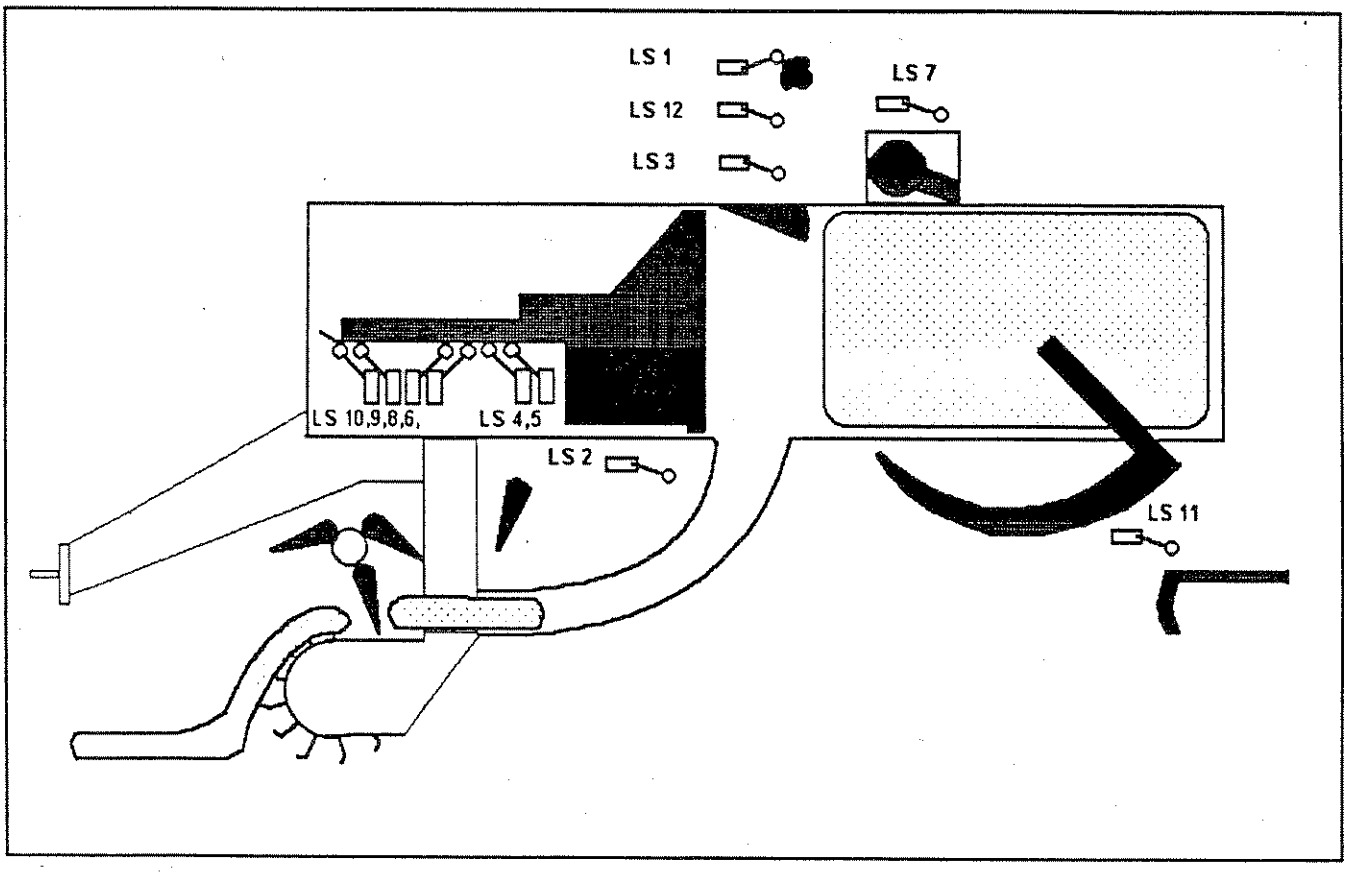


Fig 27. The First Feeder delivers the product to be baled to the Feed Chute.

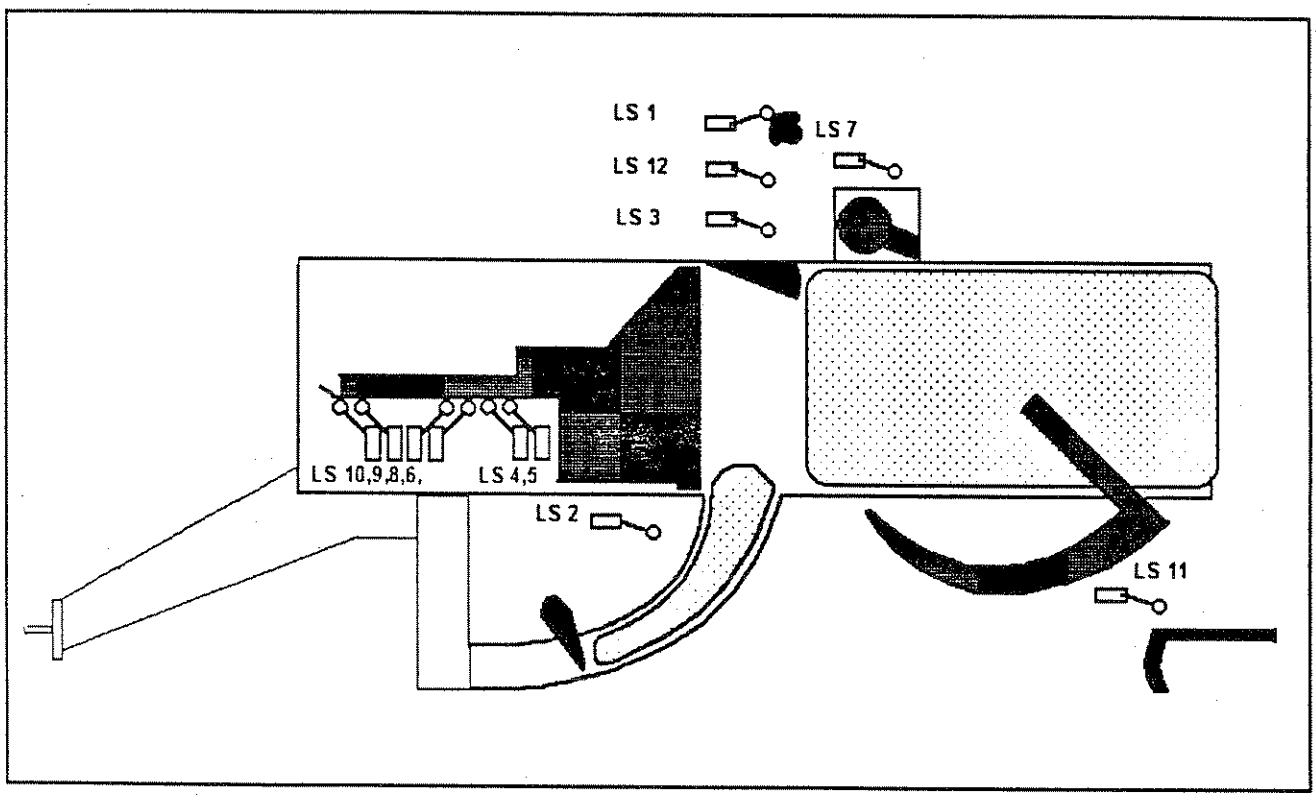


Fig. 28 Product in the feed chute is moved by the Feed Fork

BEGIN PLUNGER ADVANCE

A. As material is fed into the baler the feed fork fills the chamber until the Charge Sensor fingers are raised and LS 3 is operated.
B. The feed Fork will operate LS 2 at the top dead center position. Voltage supplied through LS 1 passes through LS 2 and LS 3 to set Relay 1.
C. When Relay 1 is set, the Feed Fork stops and the plunger begins to advance at full speed.

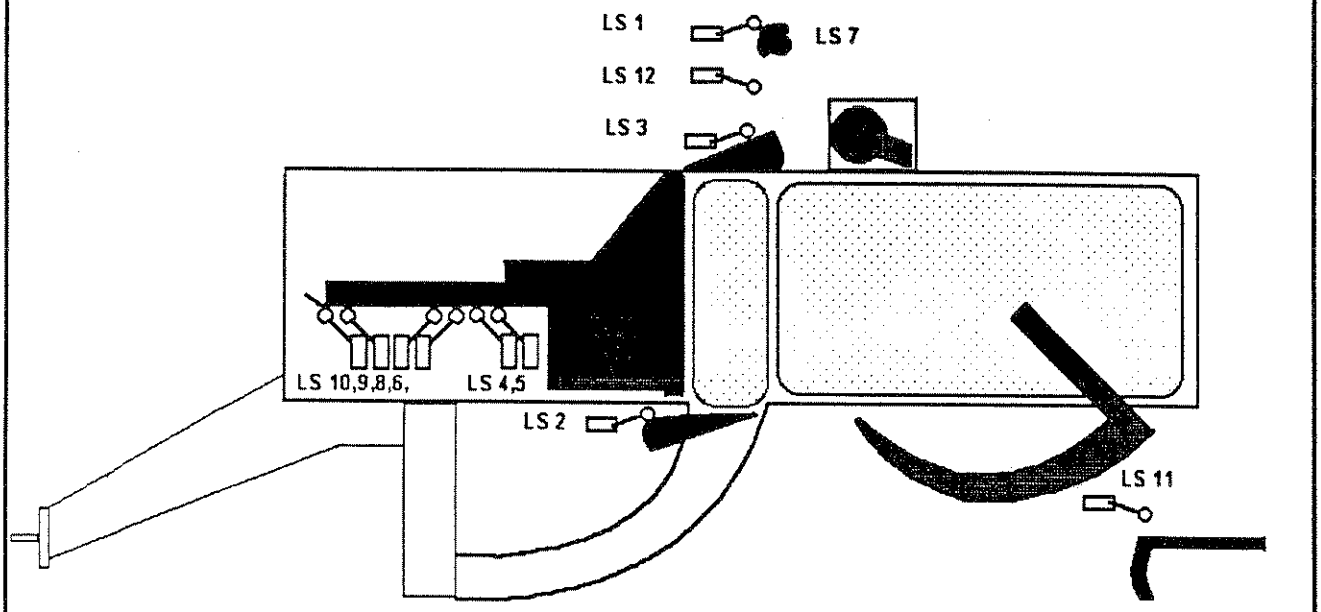


Fig.29 Charge Sensor fingers are raised and LS 3 is operated.

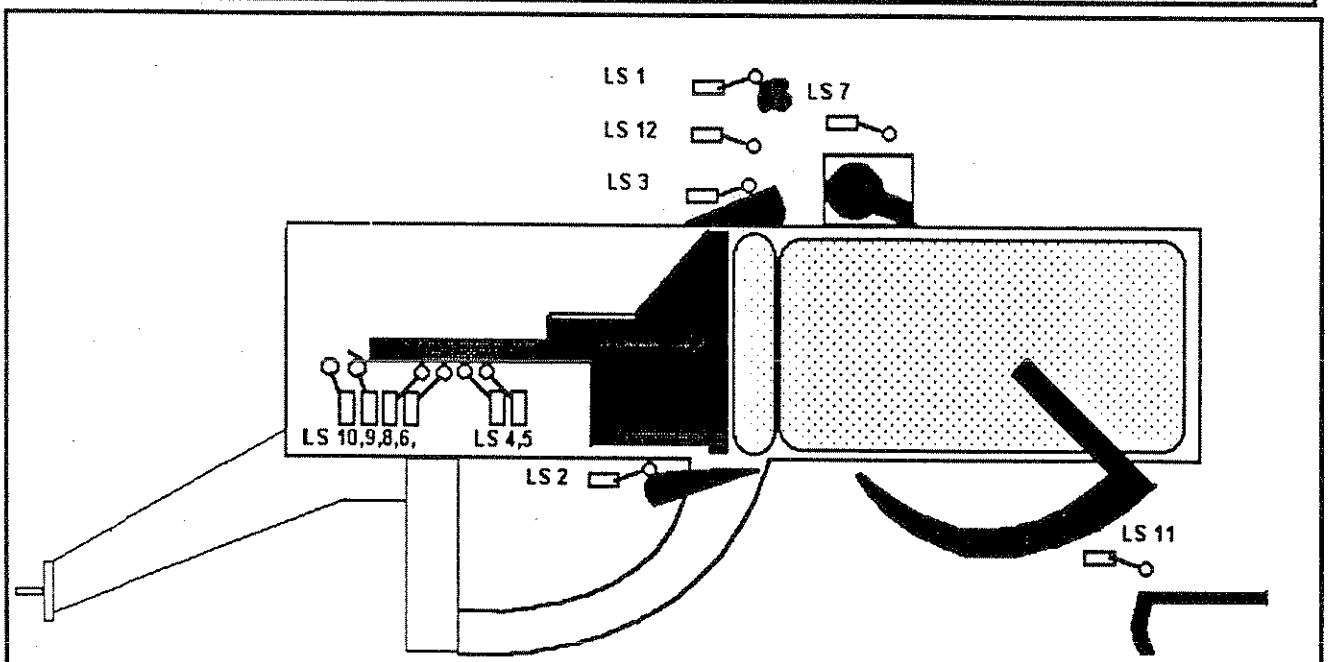
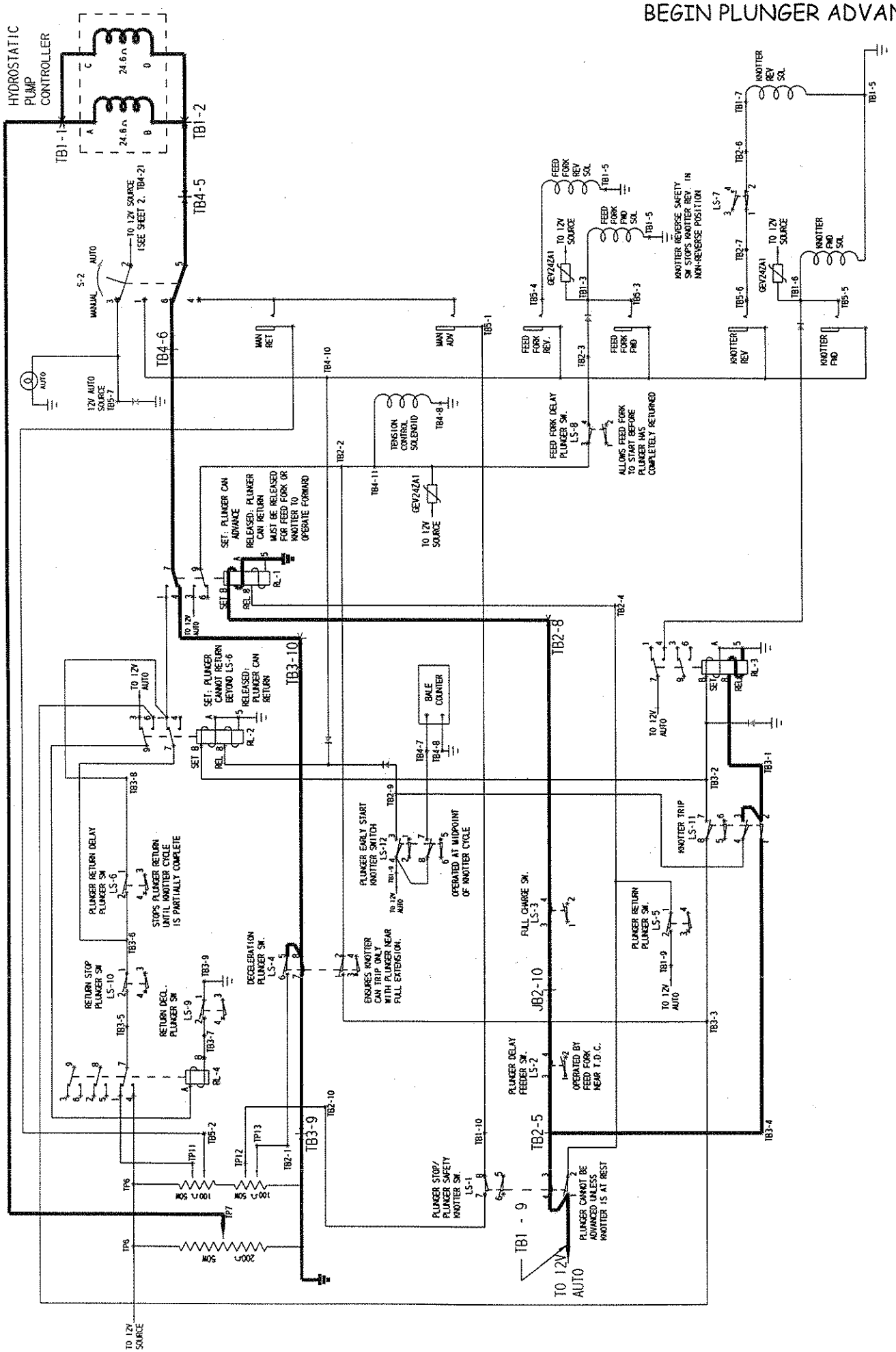


Fig. 30 Plunger extending, compressing product.


BEGIN PLUNGER ADVANCE
HYDROSTATIC PUMP CONTROLLER
TB1-1
TB1-2
TB4-5
TB4-6
TB4-10
TB2-2
TB2-8
TB3-10
TB3-9
TB2-10
TB2-5
JB2-10
TB1 - 9
TB3-1
TB3-2
TB3-3
TB3-4
TB1-5
TB1-7
TB2-6
TB2-7
TB1-6
TB5-1
TB5-2
TB5-3
TB5-4
TB5-5
TB5-6
TB4-11
TB4-8
TB4-7
TB3-8
TB3-5
TB3-7
TB2-4
TB2-3
TB1-3
TB1-4
TB1-8
TB1-9
TB1-10
TB2-1
TB3-6
TB4-9
TB2-9
TP6
TP7
TP11
TP12
TP13
S-2
MANUAL
AUTO
TO 12V SOURCE (SEE SHEET 2, TB4-21)
12V AUTO SOURCE TB5-7
TO 12V AUTO
TO 12V SOURCE
MAIN RET
MAIN ADV
FEED FORK REV.
FEED FORK FWD
KNOTTER REV
KNOTTER FWD
KNOTTER REV SOL
FEED FORK REV SOL
FEED FORK FWD SOL
KNOTTER FWD SOL
GEV24ZA1
KNOTTER REVERSE SAFETY SW STOPS KNOTTER REV. IN NON-REVERSE POSITION
TENSION CONTROL SOLENOID
FEED FORK DELAY PLUNGER SW. LS-8
ALLOWS FEED FORK TO START BEFORE PLUNGER HAS COMPLETELY RETURNED
SET: PLUNGER CAN ADVANCE
RELEASED: PLUNGER CAN RETURN MUST BE RELEASED FOR FEED FORK OR KNOTTER TO OPERATE FORWARD
SET: PLUNGER CANNOT RETURN BEYOND LS-6
RELEASED: PLUNGER CAN RETURN
BALE COUNTER
PLUNGER EARLY START KNOTTER SWITCH LS-12
ENSURES KNOTTER CAN TRIP ONLY WITH PLUNGER NEAR FULL EXTENSION.
OPERATED AT MIDPOINT OF KNOTTER CYCLE
PLUNGER RETURN DELAY PLUNGER SW. LS-6
STOPS PLUNGER RETURN UNTIL KNOTTER CYCLE IS PARTIALLY COMPLETE
RETURN STOP PLUNGER SW. LS-10
RETURN DECL. PLUNGER SW. LS-9
DECELERATION PLUNGER SW. LS-4
FULL CHARGE SW. LS-3
PLUNGER RETURN PLUNGER SW. LS-5
KNOTTER TRIP LS-11
PLUNGER DELAY FEEDER SW. LS-2
OPERATED BY FEED FORK NEAR T.D.C.
PLUNGER STOP/ PLUNGER SAFETY KNOTTER SW. LS-1
PLUNGER CANNOT BE ADVANCED UNLESS KNOTTER IS AT REST
RL-1
RL-2
RL-3
RL-4
100Ω 50W
200Ω 50W

PLUNGER ADVANCE / DECELERATED ADVANCE

As the plunger advances, the following switches are released in sequence.

A. LS 10 is released
B. LS 9 is released. Relay 4 is set but has no affect
C. LS 8 is released.
D. LS 6 is released.
E. LS 3 is released as plunger pushes material past the sensor fingers allowing it to drop.
F. LS 4 is released. This causes the plunger to slow to about 25% of full speed.

Reducing the speed of the plunger near the fully extended position allows more force to be applied to the material being compressed.

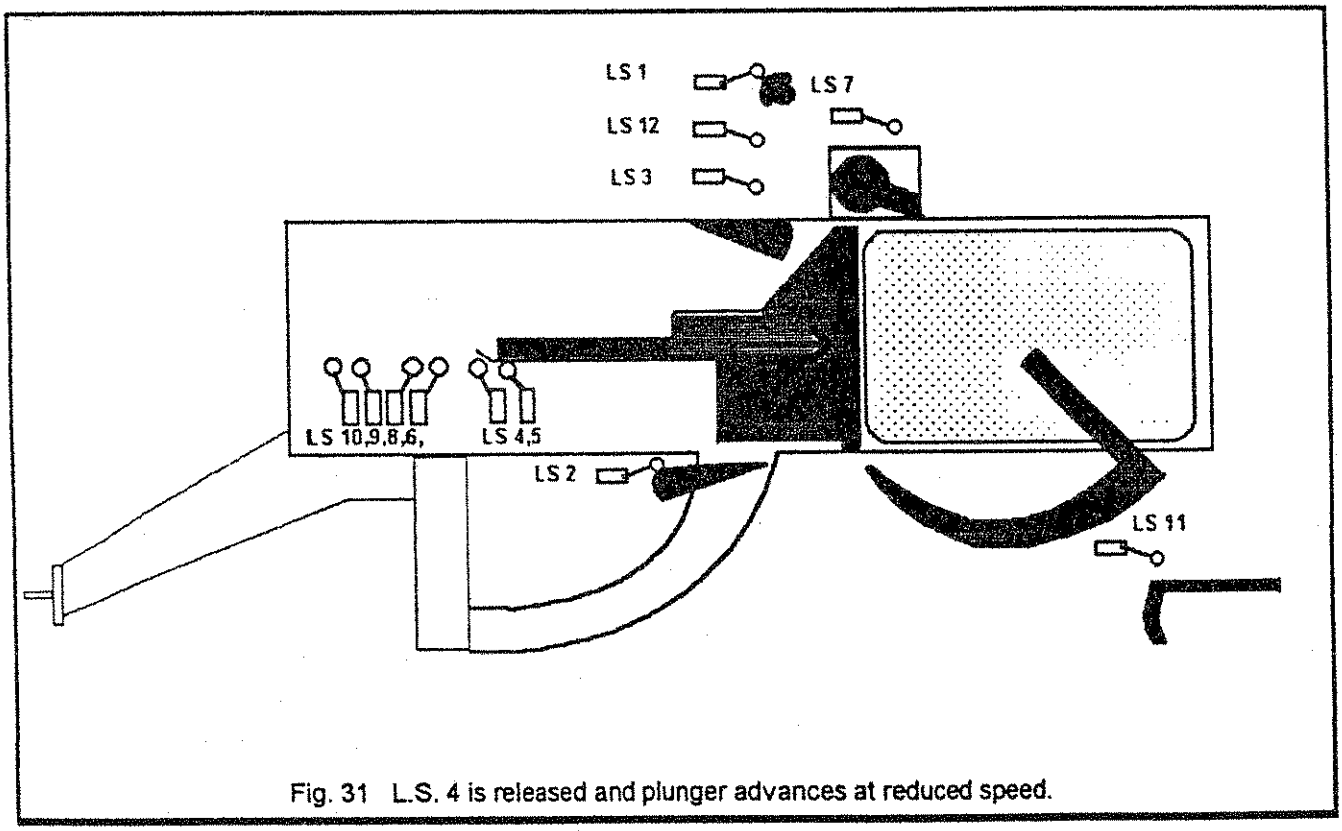
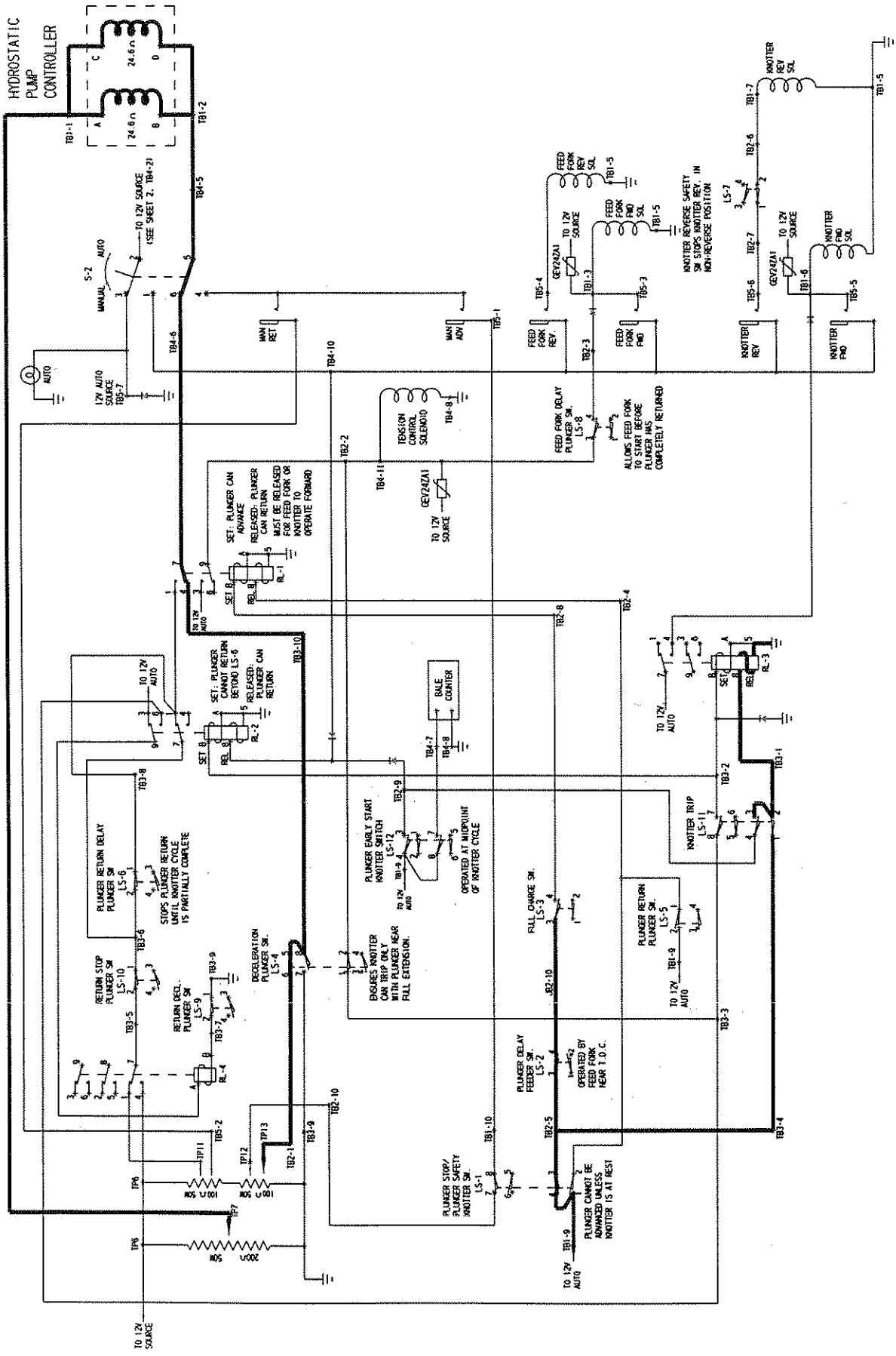


Fig. 31 L.S. 4 is released and plunger advances at reduced speed.


HYDROSTATIC PUMP CONTROLLER
TO 12V SOURCE (SEE SHEET 2, TB4-2)
MANUAL
AUTO
S-2
12V AUTO SOURCE TB5-7
MAN RET
MAN ADV
FEED FORK REV
FEED FORK FWD
KNOTTER REV
KNOTTER FWD
KNOTTER REVERSE SAFETY SW STOPS KNOTTER REV. IN NON-REVERSE POSITION
TORSION CONTROL SOLENOID
FEED FORK DELAY PLUNGER SW. LS-8
ALLOWS FEED FORK TO START BEFORE PLUNGER HAS COMPLETELY RETURNED
SET: PLUNGER CAN ADVANCE
RELEASED: PLUNGER CAN RETURN
MUST BE RELEASED FOR FEED FORK OR KNOTTER TO OPERATE FORWARD
SET: PLUNGER CANNOT RETURN BEYOND LS-6
RELEASED: PLUNGER CAN RETURN
BALE COUNTER
PLUNGER RETURN DELAY PLUNGER SW. LS-6
STOPS PLUNGER RETURN UNTIL KNOTTER CYCLE IS PARTIALLY COMPLETE
PLUNGER EARLY START KNOTTER SWITCH LS-12
OPERATED AT MIDPOINT OF KNOTTER CYCLE
ENSURES KNOTTER CAN TRIP ONLY WITH PLUNGER NEAR FULL EXTENSION.
KNOTTER TRIP LS-11
FULL CHARGE SW. LS-3
PLUNGER RETURN PLUNGER SW. LS-5
RETURN STOP PLUNGER SW LS-10
RETURN DECEL. PLUNGER SW LS-9
DECELERATION PLUNGER SW. LS-4
PLUNGER DELAY FEEDER SW. LS-2
OPERATED BY FEED FORK NEAR T.D.C.
PLUNGER STOP/ PLUNGER SAFETY KNOTTER SW. LS-1
PLUNGER CANNOT BE ADVANCED UNLESS KNOTTER IS AT REST
TO 12V AUTO
TO 12V SOURCE
100 OHM
200 OHM

PLUNGER FULLY ADVANCED

LS 5 is released. This provides voltage to release Relay 1. When Relay 1 is released the plunger can begin to retract at full speed.

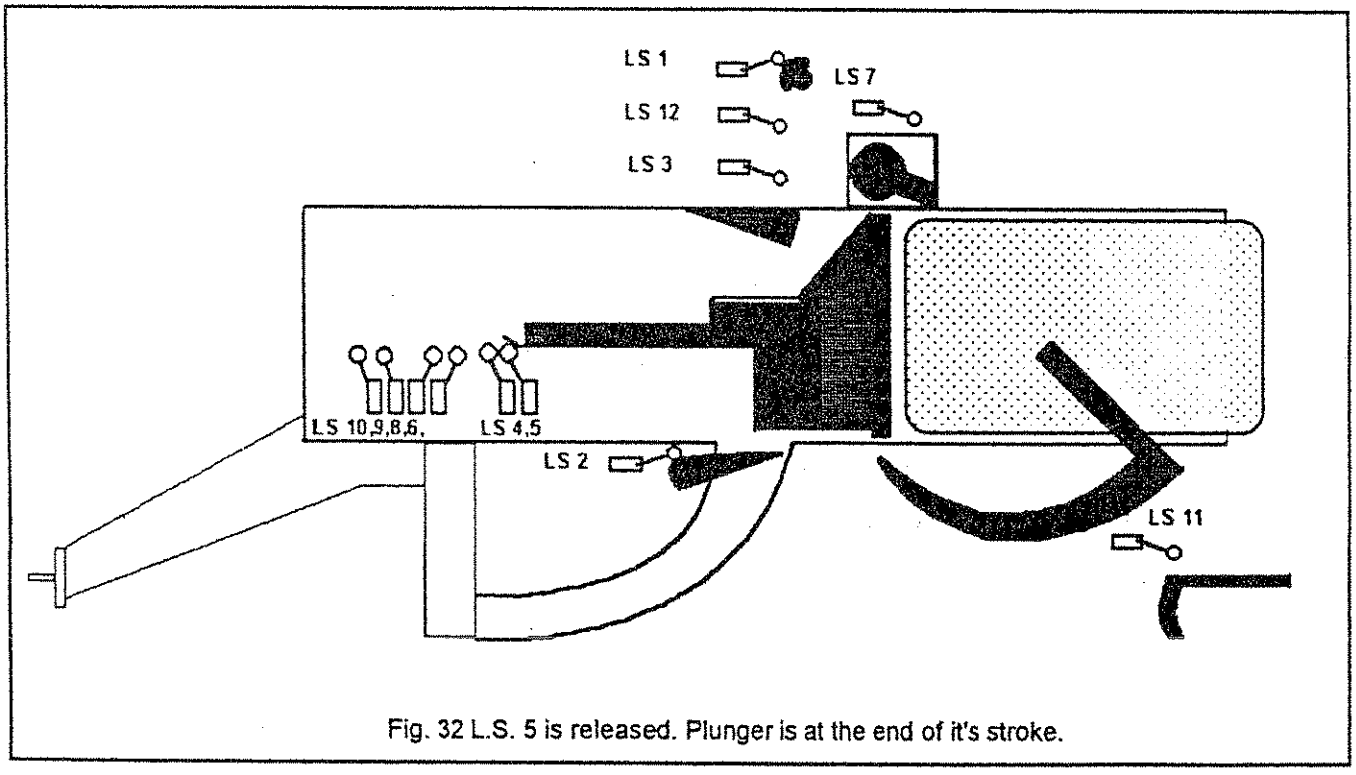
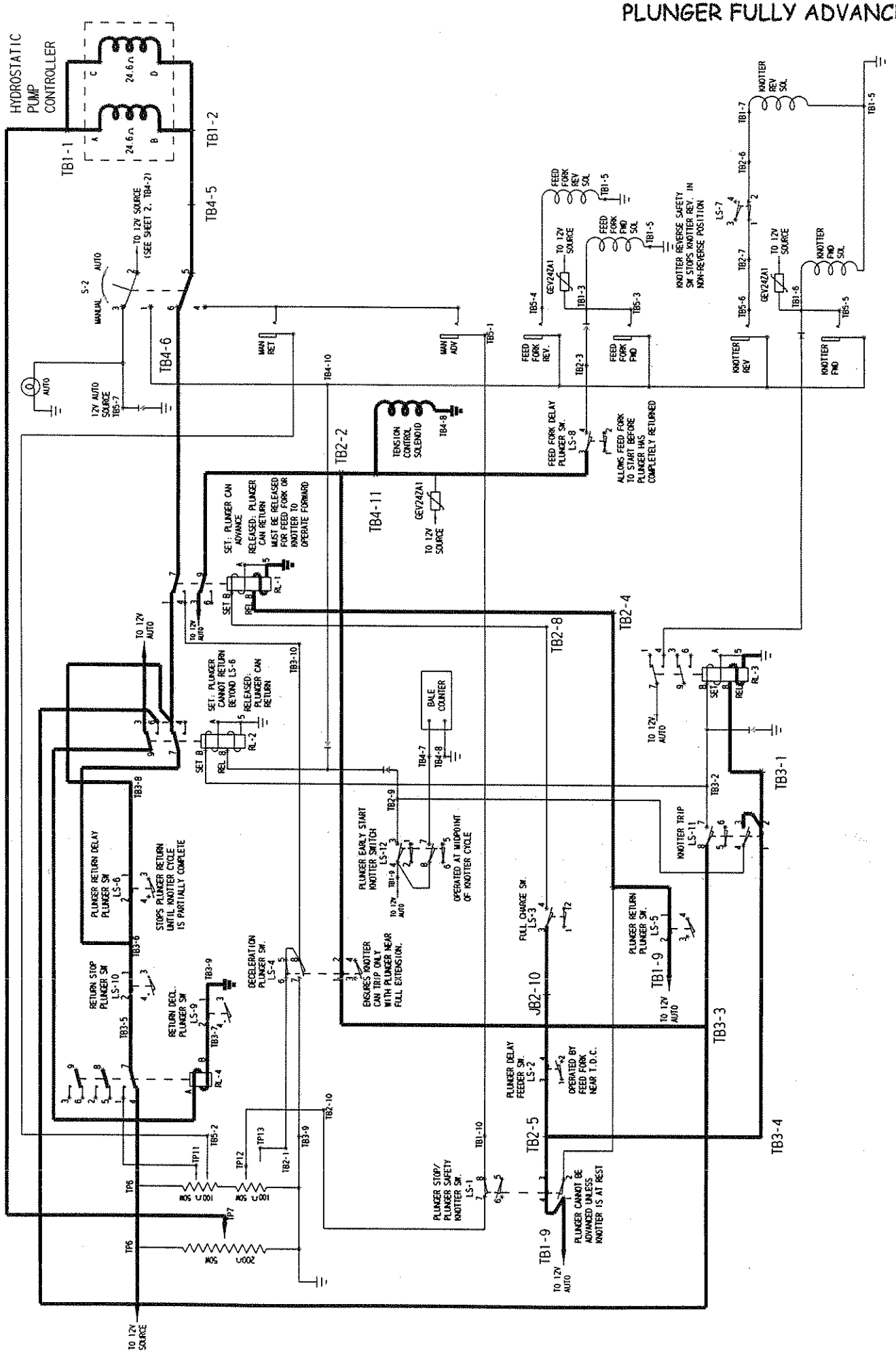


Fig. 32 L.S. 5 is released. Plunger is at the end of it's stroke.


HYDROSTATIC PUMP CONTROLLER
TB1-1
TB1-2
TB4-5
TB4-6
TB2-2
TB2-4
TB2-8
TB4-11
TB2-5
JB2-10
TB1-9
TB3-1
TB3-2
TB3-3
TB3-4
TB3-5
TB3-6
TB3-7
TB3-8
TB3-9
TB3-10
TB4-7
TB4-8
TB5-1
TB5-2
TB5-3
TB5-4
TB5-5
TB5-6
TB5-7
TB1-3
TB1-5
TB1-6
TB1-7
TB2-1
TB2-3
TB2-6
TB2-7
TB2-9
TB2-10
TB1-10
TP5
TP6
TP7
TP11
TP12
TP13
24.6Ω
100Ω 50W
200Ω 50W
S-2
MANUAL
AUTO
TO 12V SOURCE (SEE SHEET 2, TB4-2)
12V AUTO SOURCE TB5-7
TO 12V AUTO
TO 12V SOURCE
MAIN RET
MAIN ADV
TENSION CONTROL SOLENOID
GEV24ZA1
FEED FORK REV.
FEED FORK FWD
FEED FORK REV SOL
FEED FORK FWD SOL
FEED FORK DELAY PLUNGER SW. LS-8
ALLOWS FEED FORK TO START BEFORE PLUNGER HAS COMPLETELY RETURNED
KNOTTER REVERSE SAFETY SW. STOPS KNOTTER REV. IN NON-REVERSE POSITION
KNOTTER REV
KNOTTER FWD
KNOTTER REV SOL
KNOTTER FWD SOL
LS-7
SET: PLUNGER CAN ADVANCE
RELEASED: PLUNGER CAN RETURN MUST BE RELEASED FOR FEED FORK OR KNOTTER TO OPERATE FORWARD
RL-1
SET: PLUNGER CANNOT RETURN BEYOND LS-6
RELEASED: PLUNGER CAN RETURN
RL-2
BALE COUNTER
RL-3
RETURN STOP PLUNGER SW. LS-10
RETURN DECL. PLUNGER SW. LS-9
RL-4
DECELERATION PLUNGER SW. LS-4
PLUNGER RETURN DELAY PLUNGER SW. LS-6
STOPS PLUNGER RETURN UNTIL KNOTTER CYCLE IS PARTIALLY COMPLETE
PLUNGER EARLY START KNOTTER SWITCH LS-12
OPERATED AT MIDPOINT OF KNOTTER CYCLE
ENSURES KNOTTER CAN TRIP ONLY WITH PLUNGER NEAR FULL EXTENSION.
FULL CHARGE SW. LS-3
PLUNGER RETURN PLUNGER SW. LS-5
KNOTTER TRIP LS-11
PLUNGER DELAY FEEDER SW. LS-2
OPERATED BY FEED FORK NEAR T.D.C.
PLUNGER STOP/ PLUNGER SAFETY KNOTTER SW. LS-1
PLUNGER CANNOT BE ADVANCED UNLESS KNOTTER IS AT REST
TO 12V SOURCE

PLUNGER RETRACT

As the plunger retracts the following switches are operated in sequence:

A. LS 5 is operated
B. LS 4 is operated
C. LS 6 is operated
D. LS 8 is operated which causes feed fork to start.

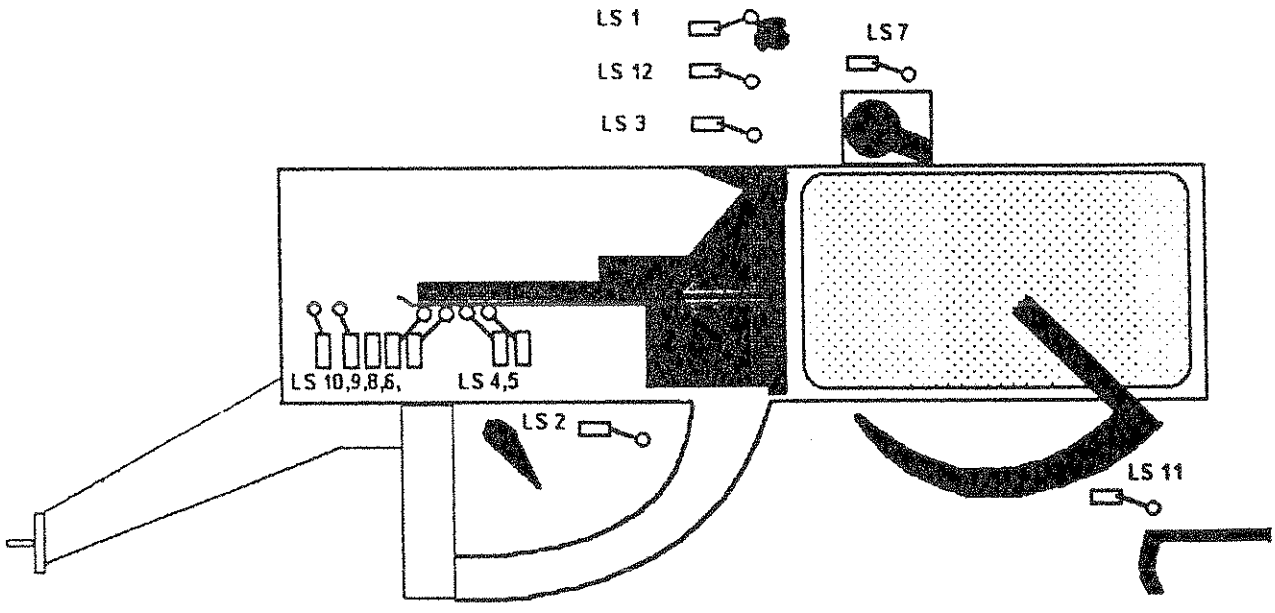
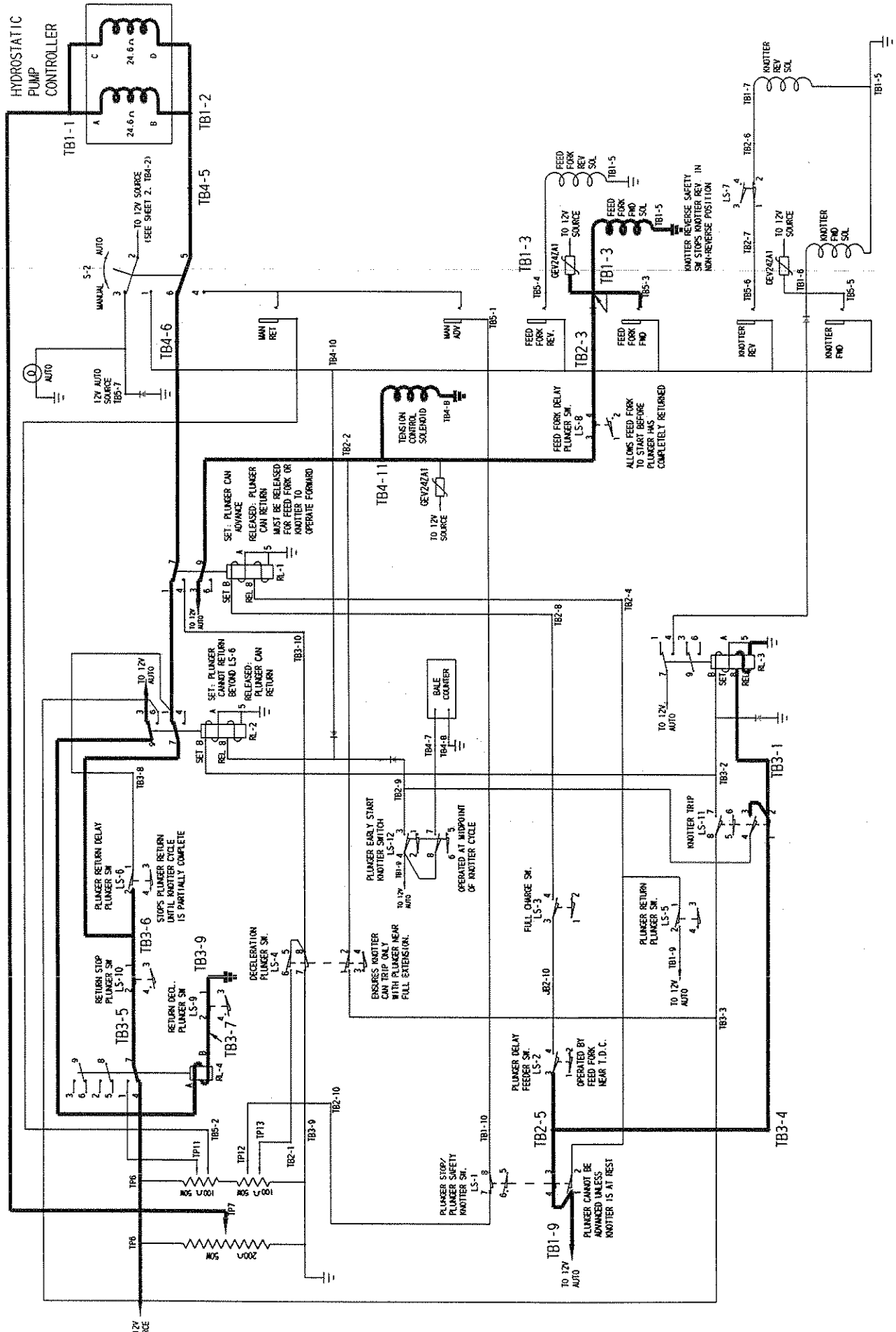


Fig. 33 Plunger on return stroke and L.S. 4.5.6.and 8 are operated

PLUNGER RETRACT, FEEDFORK STARTED



PLUNGER DECELERATED RETRACT

LS 9 is operated. This opens the circuit to Relay 4 and causes the plunger slow to about 25% of full speed. This prevents the plunger cylinder from bottoming when it reaches the end of the stroke

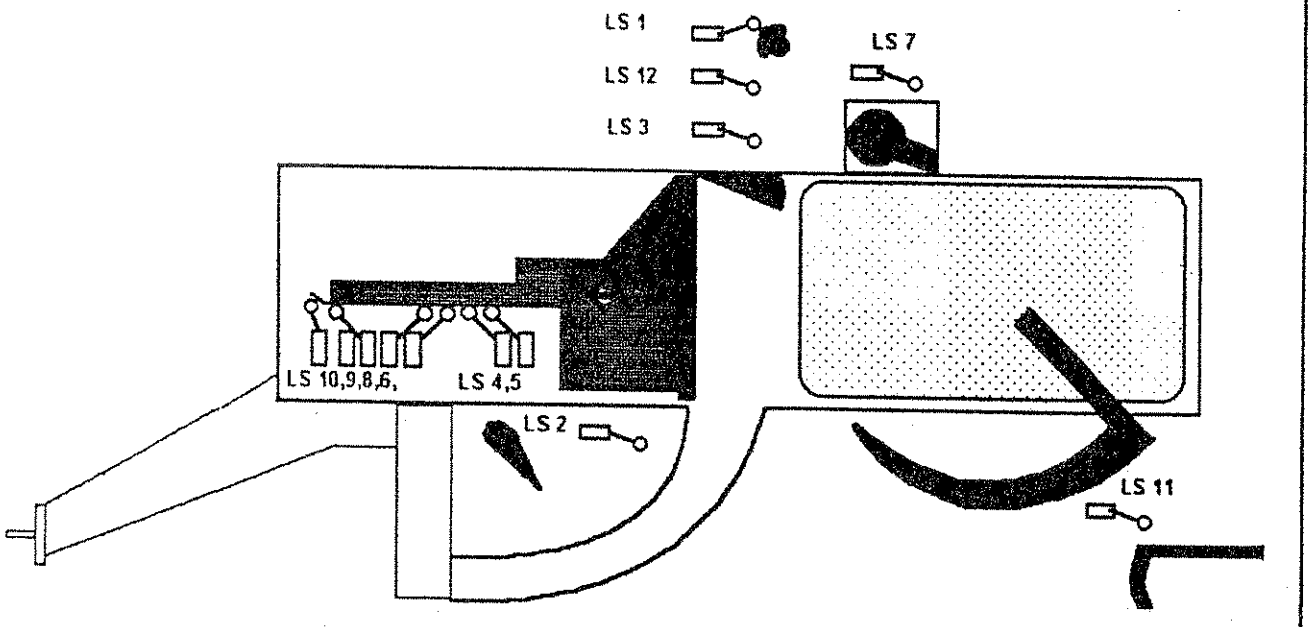
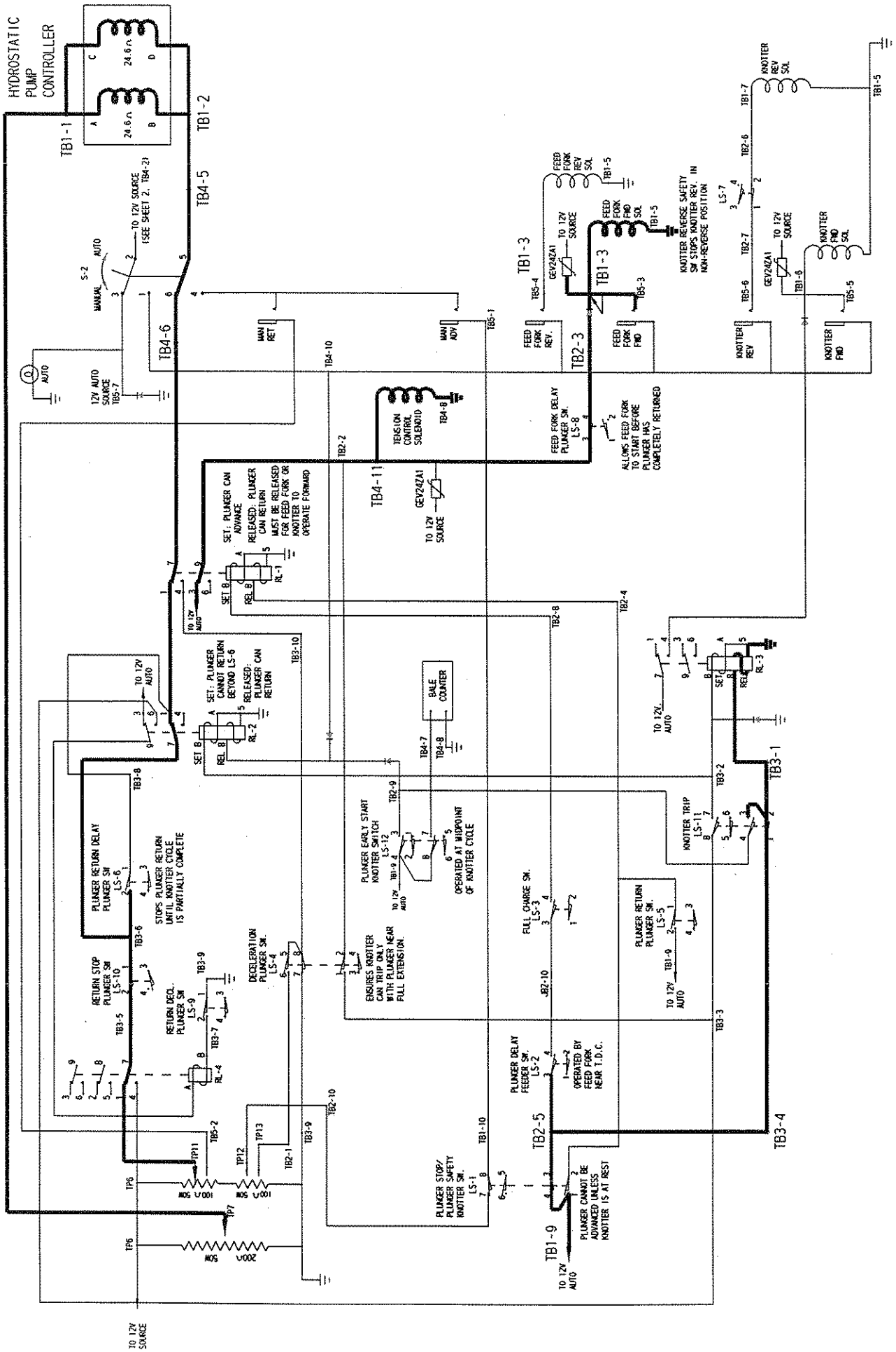


Fig.34 As plunger retracts L.S. 9 is operated.

PLUNGER DECELERATED RETRACT



PLUNGER RETURN STOP

LS 10 is operated. This stops the plunger retract. Material will again be delivered to the bale chamber by the feed fork.

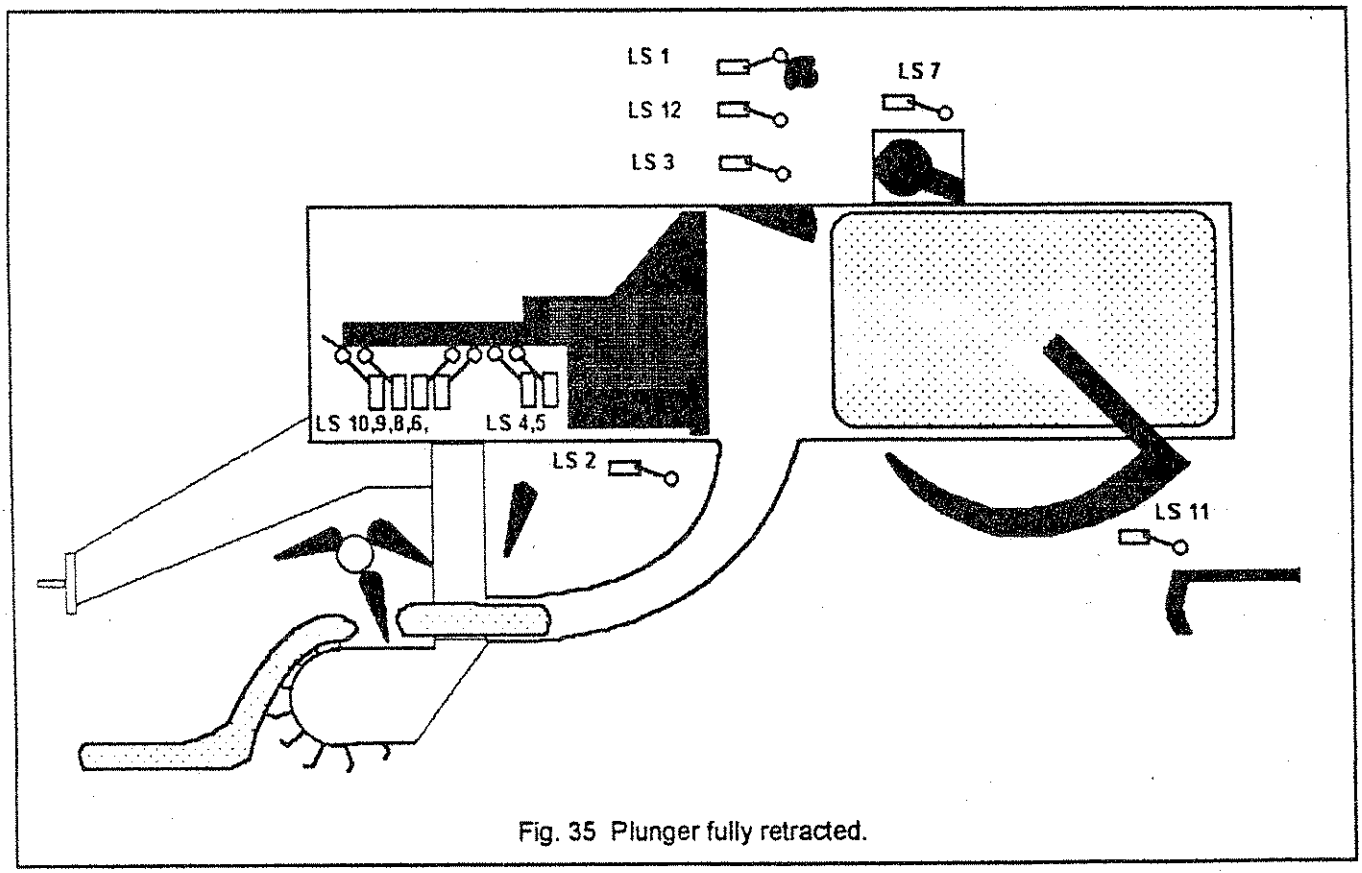
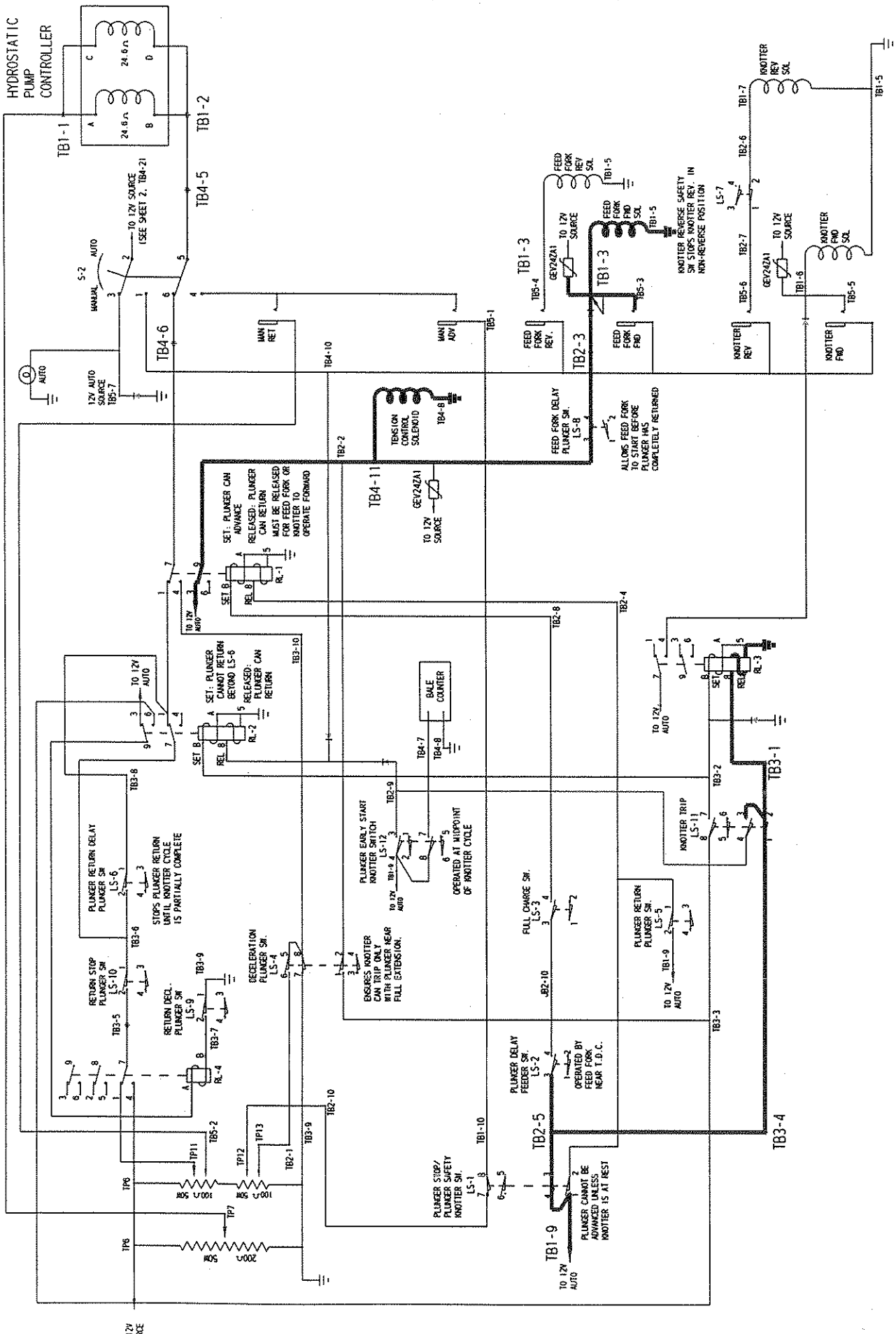


Fig. 35 Plunger fully retracted.

PLUNGER RETRACT STOP



ELECTRICAL SEQUENCE OF PLUNGER STROKE DURING TIE CYCLE

The sequence begins with the plunger in the home position. The needle yoke must also be in the home position. This places LS 1 in operated condition to provide voltage to LS 2.

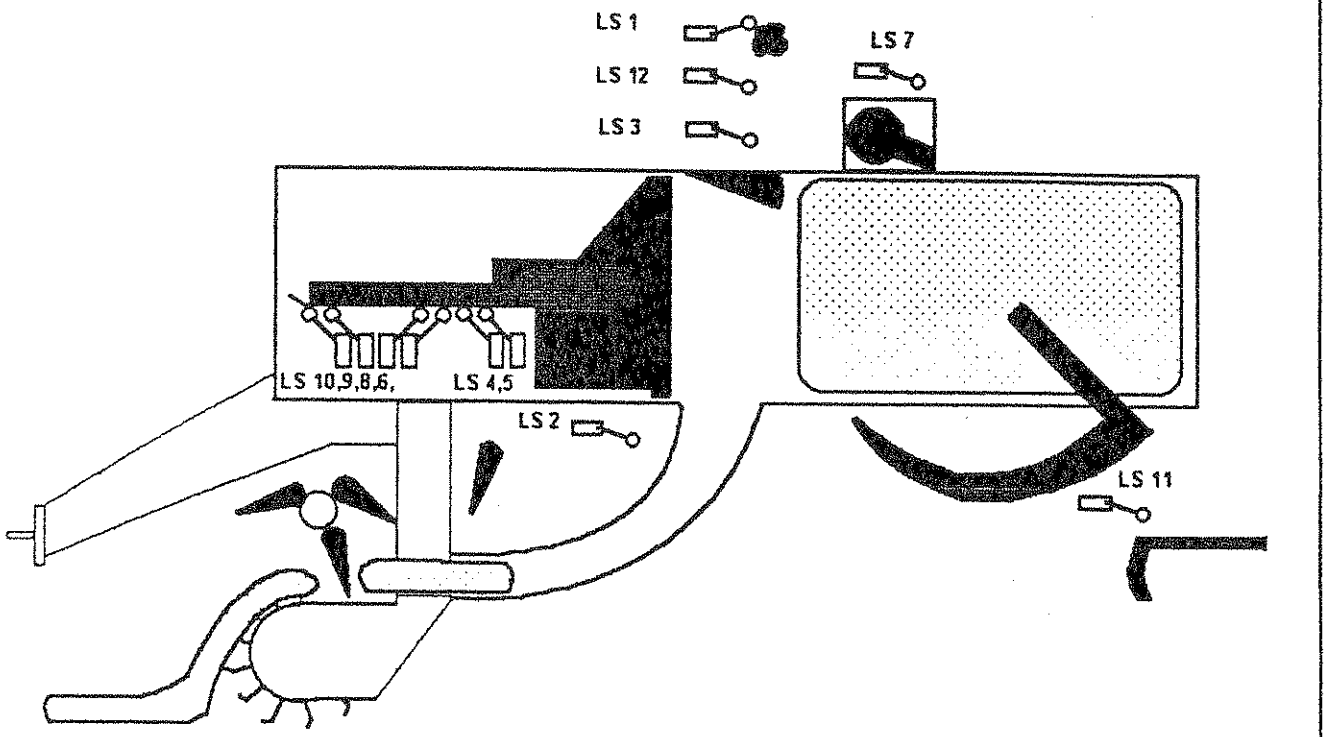


Fig 36. The First Feeder delivers the product to be baled to the Feed Chute.

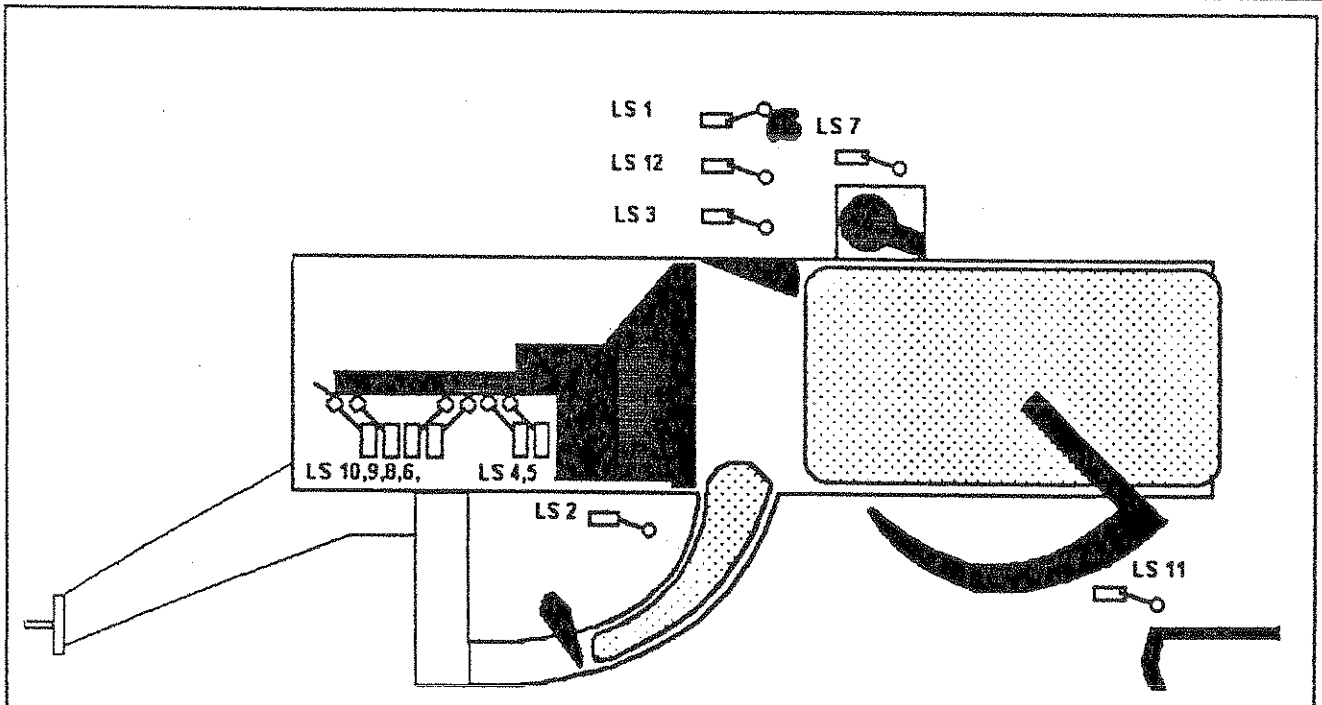
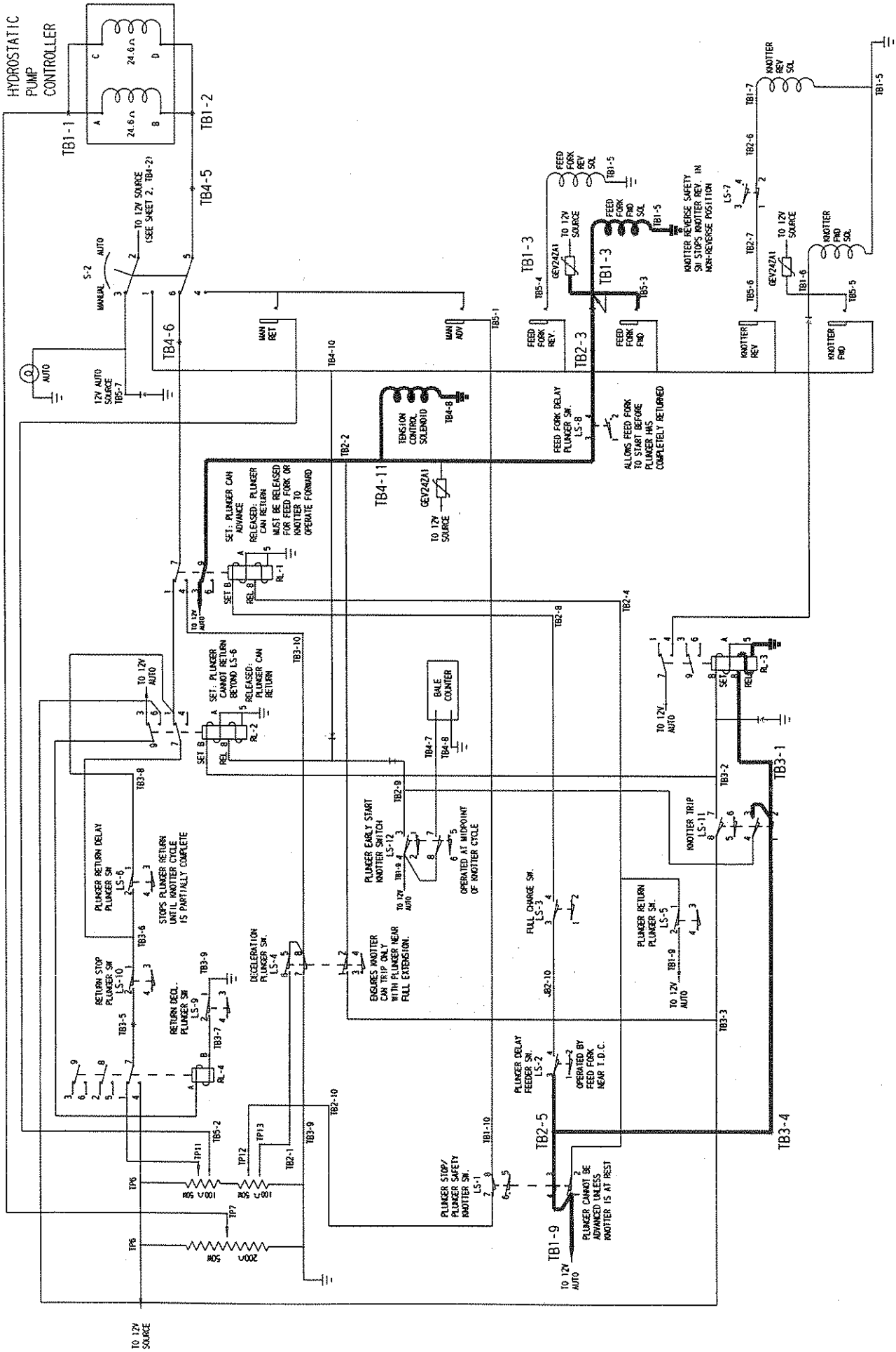


Fig. 37 Material in the feed chute is moved by the Feed Fork

FEEDFORK OPERATING CHAMBER NOT FULL



BEGIN PLUNGER ADVANCE

A. As material is fed into the baler the feed fork fills the chamber until the Charge Sensor fingers are raised and LS 3 is operated.
B. The feed Fork will operate LS 2 at the top dead center position. Voltage supplied through LS 1 passes through LS 2 and LS 3 to set Relay 1.
C. When Relay 1 is set, the Feed Fork stops and the plunger begins to advance at full speed.

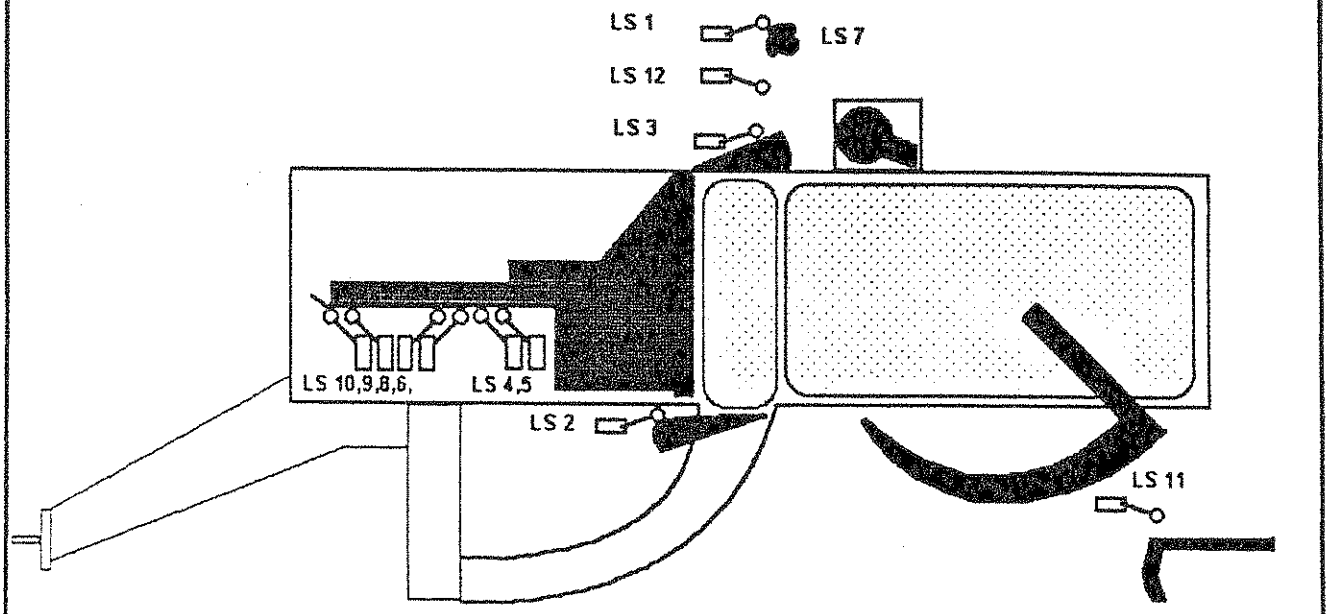


Fig38. The feed fork fills the chamber until the Charge Sensor fingers are raised and LS 3 is operated.

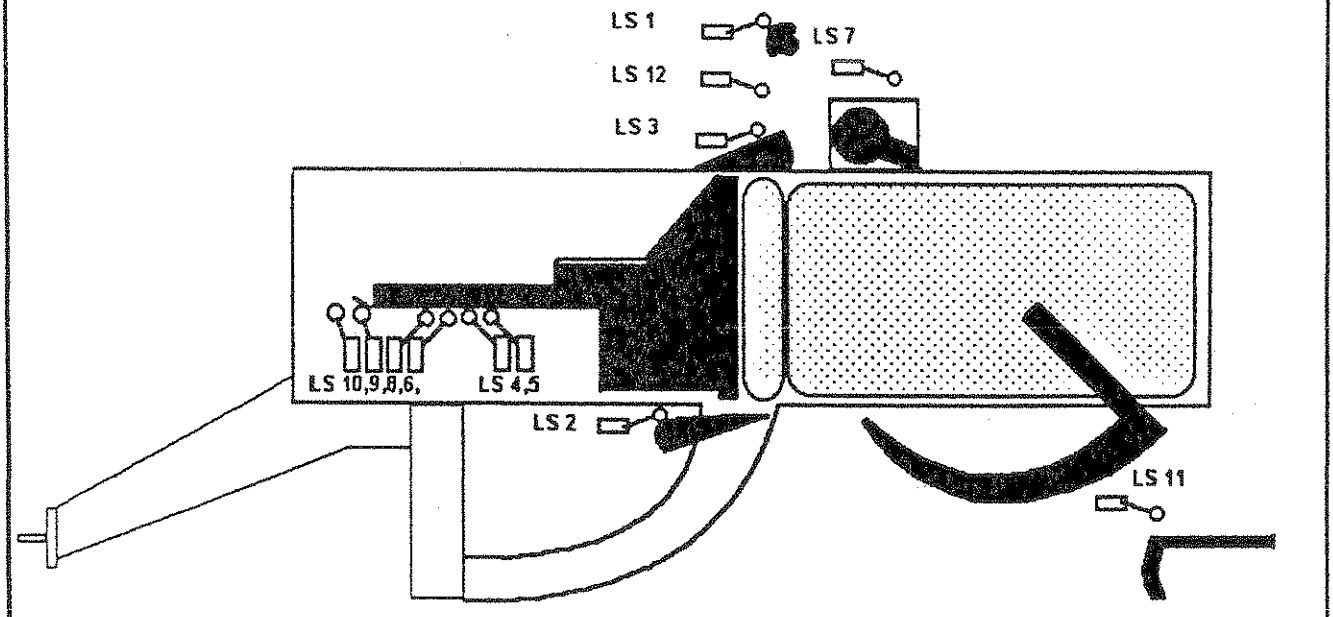
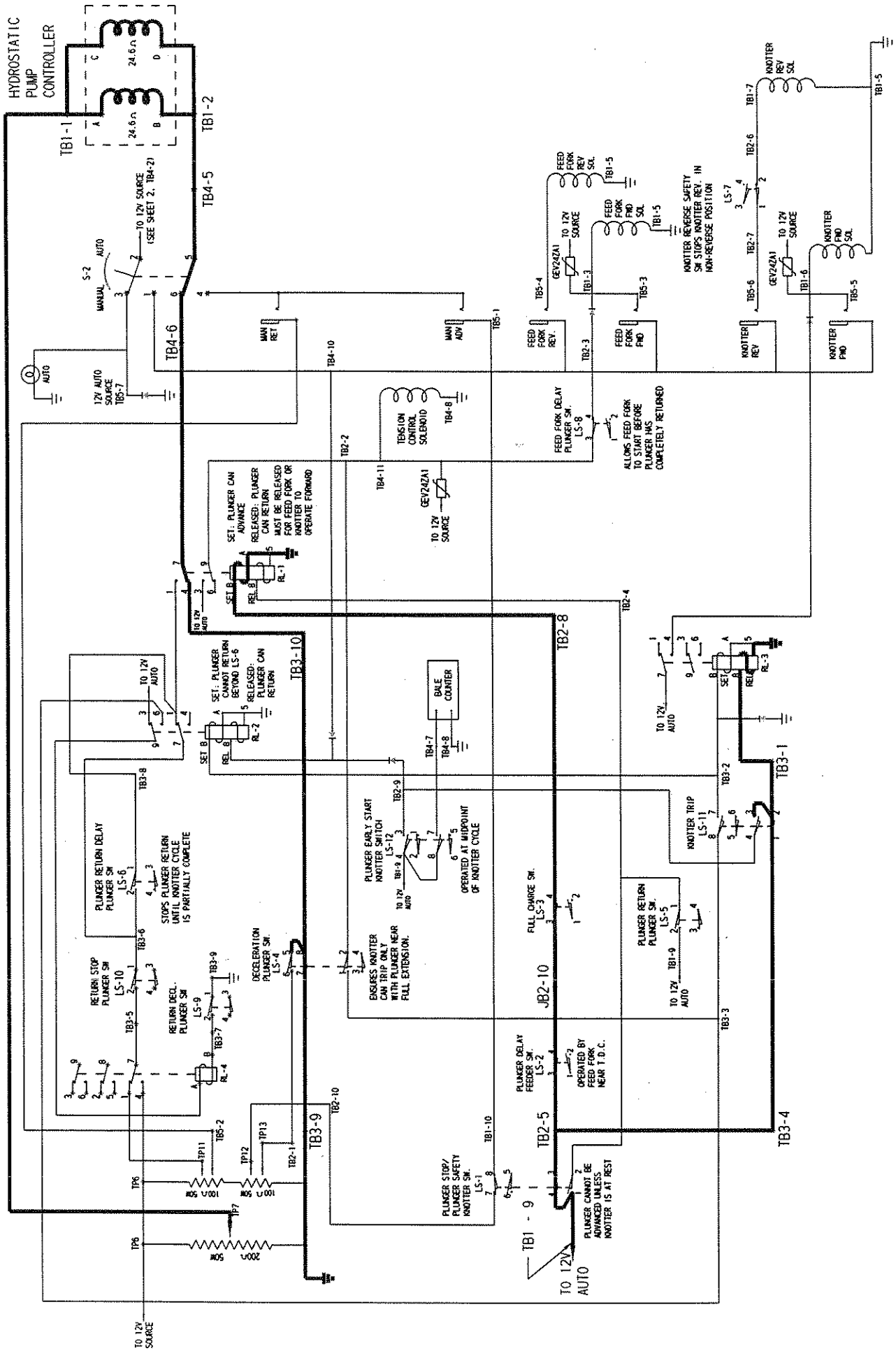


Fig. 39 Plunger extending, compressing product.


HYDROSTATIC PUMP CONTROLLER
TB1-1
TB1-2
24.6Ω
TB4-5
TB4-6
S-2
MANUAL
AUTO
TO 12V SOURCE (SEE SHEET 2, TB4-2)
12V AUTO SOURCE TB5-7
MAN RET
MAN ADV
TB4-10
TB5-1
FEED FORK REV.
FEED FORK FWD
TB2-3
GEV24ZA1
TO 12V SOURCE
TB5-4
TB5-3
TB1-3
TB1-5
KNOTTER REVERSE SAFETY SW STOPS KNOTTER REV. IN NON-REVERSE POSITION
LS-7
TB2-6
TB2-7
TB5-6
TB1-6
TB1-7
KNOTTER REV SOL
KNOTTER FWD SOL
KNOTTER REV
KNOTTER FWD
TB4-11
TB4-8
TENSION CONTROL SOLENOID
FEED FORK DELAY PLUNGER SW. LS-8
ALLOWS FEED FORK TO START BEFORE PLUNGER HAS COMPLETELY RETURNED
SET: PLUNGER CAN ADVANCE
RELEASED: PLUNGER CAN RETURN MUST BE RELEASED FOR FEED FORK OR KNOTTER TO OPERATE FORWARD
SET B
REL B
RL-1
TB2-2
TB2-4
TB2-8
TB3-10
TB3-1
TB3-2
TB3-4
TB3-9
TB2-10
TB2-5
JB2-10
TB1-9
TB1-10
SET: PLUNGER CANNOT RETURN BEYOND LS-6
RELEASED: PLUNGER CAN RETURN
RL-2
BALE COUNTER
TB4-7
TB4-9
PLUNGER EARLY START KNOTTER SWITCH LS-12
ENSURES KNOTTER CAN TRIP ONLY WITH PLUNGER NEAR FULL EXTENSION.
OPERATED AT WIDPOINT OF KNOTTER CYCLE
KNOTTER TRIP LS-11
FULL CHARGE SW. LS-3
PLUNGER RETURN PLUNGER SW. LS-5
PLUNGER RETURN DELAY PLUNGER SW LS-6
STOPS PLUNGER RETURN UNTIL KNOTTER CYCLE IS PARTIALLY COMPLETE
RETURN STOP PLUNGER SW LS-10
RETURN DECL. PLUNGER SW LS-9
DECELERATION PLUNGER SW. LS-4
RL-4
PLUNGER DELAY FEEDER SW. LS-2
OPERATED BY FEED FORK NEAR T.D.C.
PLUNGER STOP/ PLUNGER SAFETY KNOTTER SW. LS-1
PLUNGER CANNOT BE ADVANCED UNLESS KNOTTER IS AT REST
TP6
TP7
TP11
TP12
TP13
100Ω 50W
200Ω 50W
TO 12V AUTO
TO 12V SOURCE

METER ARM OPERATES L.S. 11 DURING PLUNGER ADVANCE

At some point during plunger advance the rotating meter wheel raises the meter bar enough to operate LS 11. LS 11 closes a portion of the circuit that activates the knotter. The operation of the knotter can occur only when the plunger reaches the fully extended position.

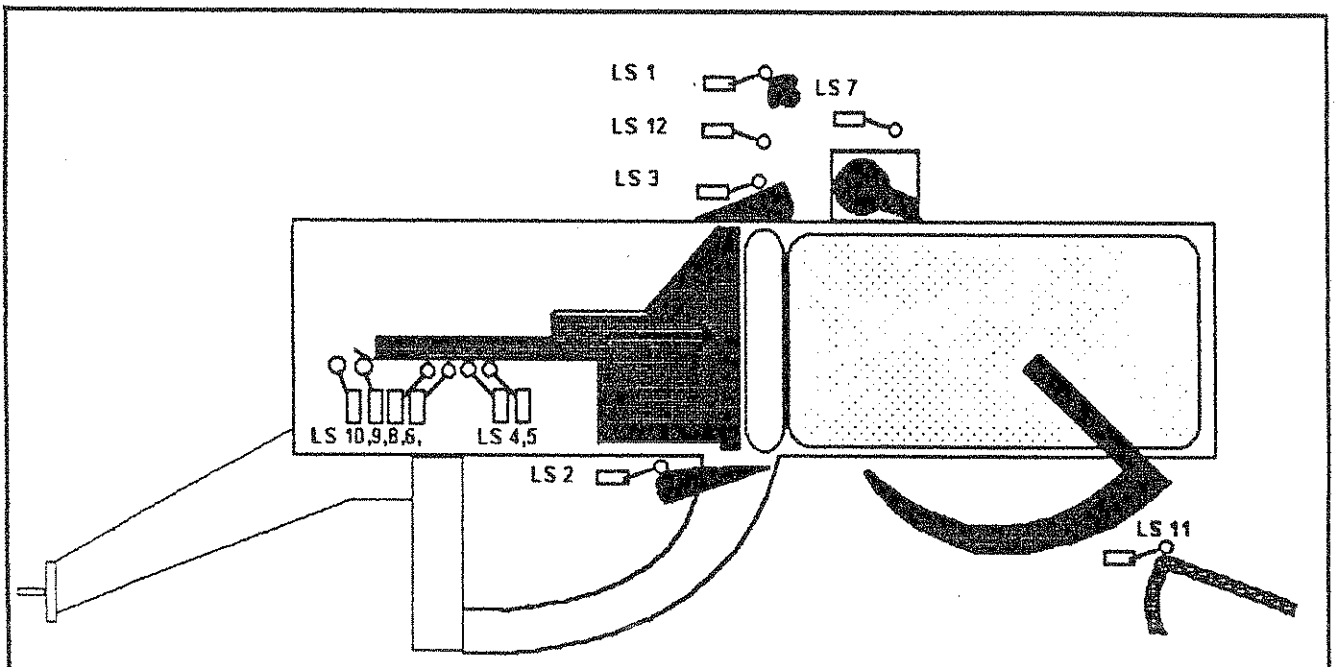
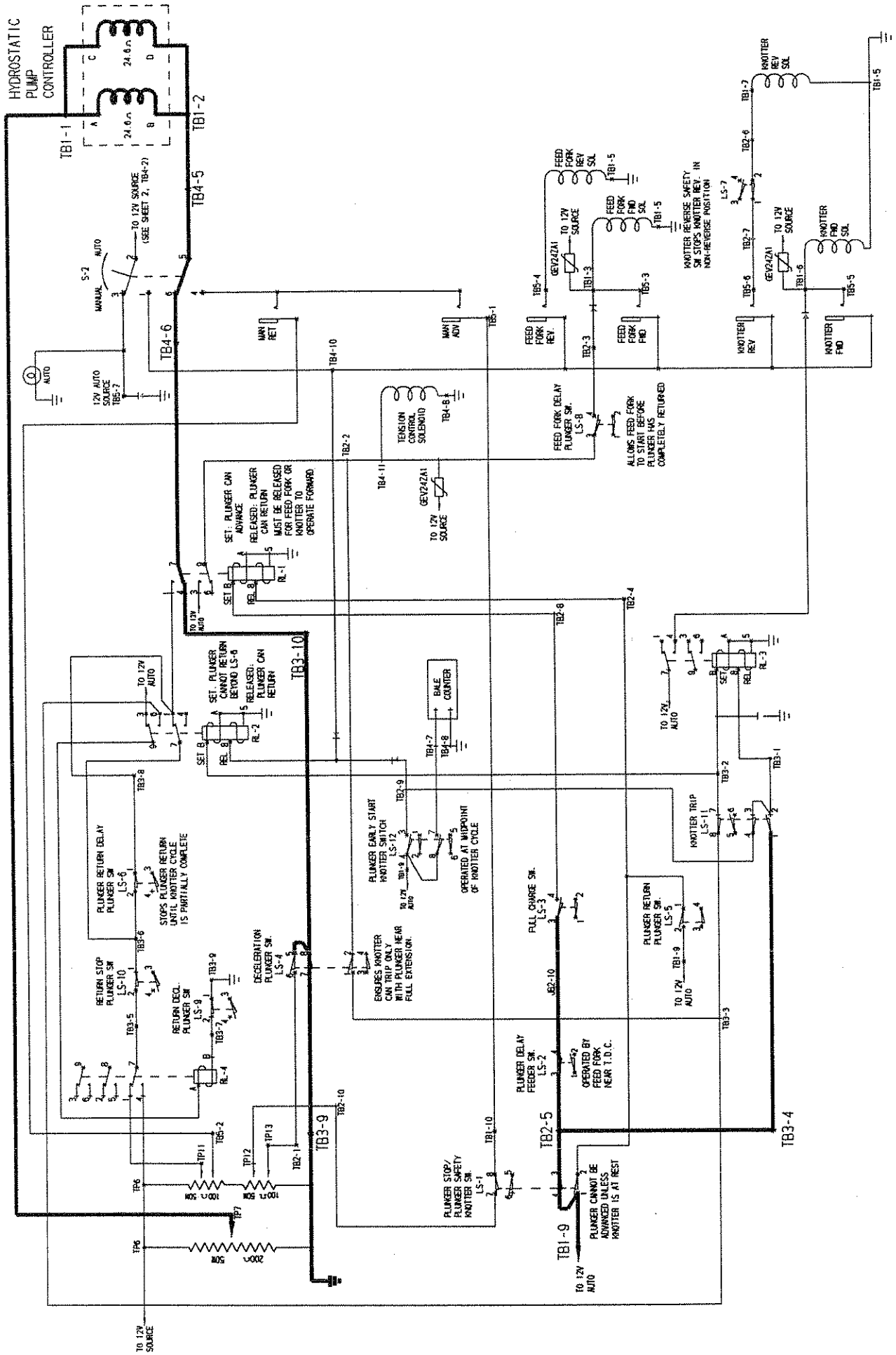


Fig. 40, Plunger advancing moves bale which raises meter arm to trip LS 11.

METER ARM OPERATES LS-11 DURING PLUNGER ADVANCE



PLUNGER ADVANCE / DECELERATED ADVANCE DURING TIE CYCLE

As the plunger advances, the following switches are released in sequence.

A. LS 10 is released
B. LS 9 is released. Relay 4 is set but has no affect
C. LS 8 is released.
D. LS 6 is released.
E. LS 3 is released as plunger pushes material past the sensor fingers allowing it to drop.
F. LS 4 is released. This causes the plunger to slow to about 25% of full speed. The circuit between Relay 1 and 3 is completed when LS 4 is released but no voltage is applied.

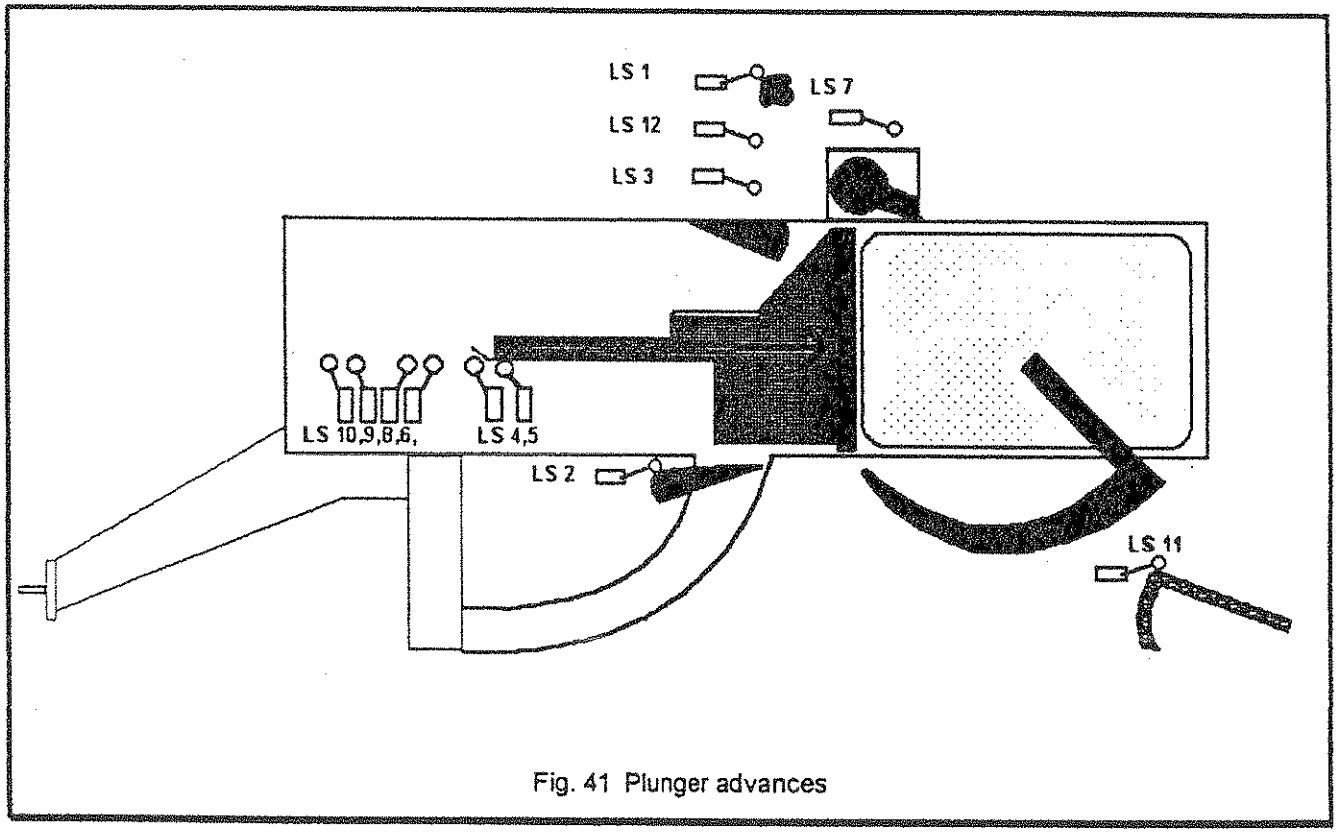
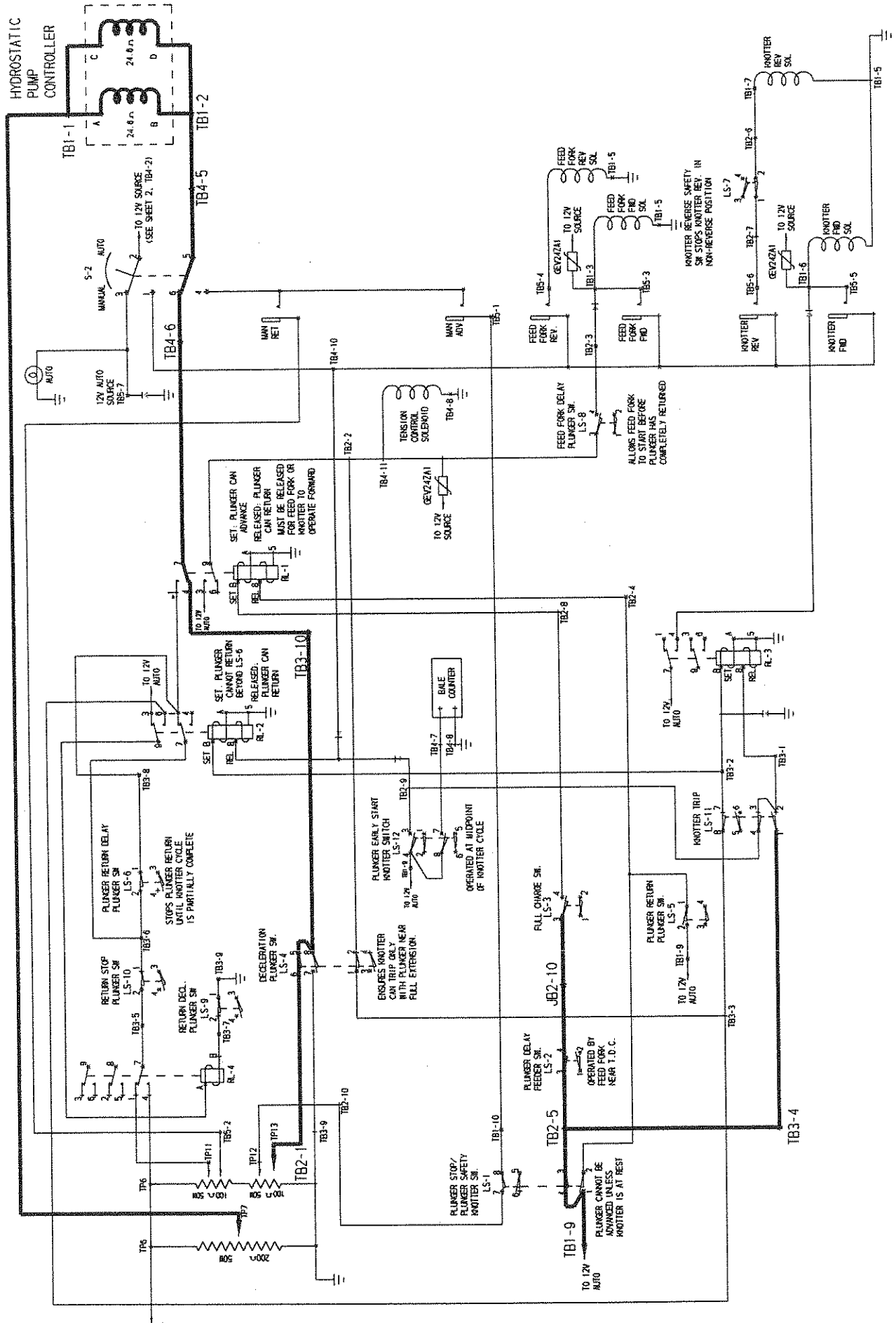


Fig. 41 Plunger advances

PLUNGER DECELERATED ADVANCE DURING A KNOTTER TIE CYCLE



PLUNGER FULLY ADVANCED

A. LS 5 is released. This provides voltage to release Relay 1.
B. When Relay 1 is released the plunger can begin to retract at full speed. Also as Relay 1 is released voltage is applied through LS 4 and LS 11 to set Relay 3.
C. When Relay 3 is set, the knotter is activated.

The circuit is designed to protect against accidental operation of the knotter drive. Unlike mechanical balers the needles cannot become out of time with the plunger. Several factors combine to assure the needles cannot be "baled" during normal baler operation.

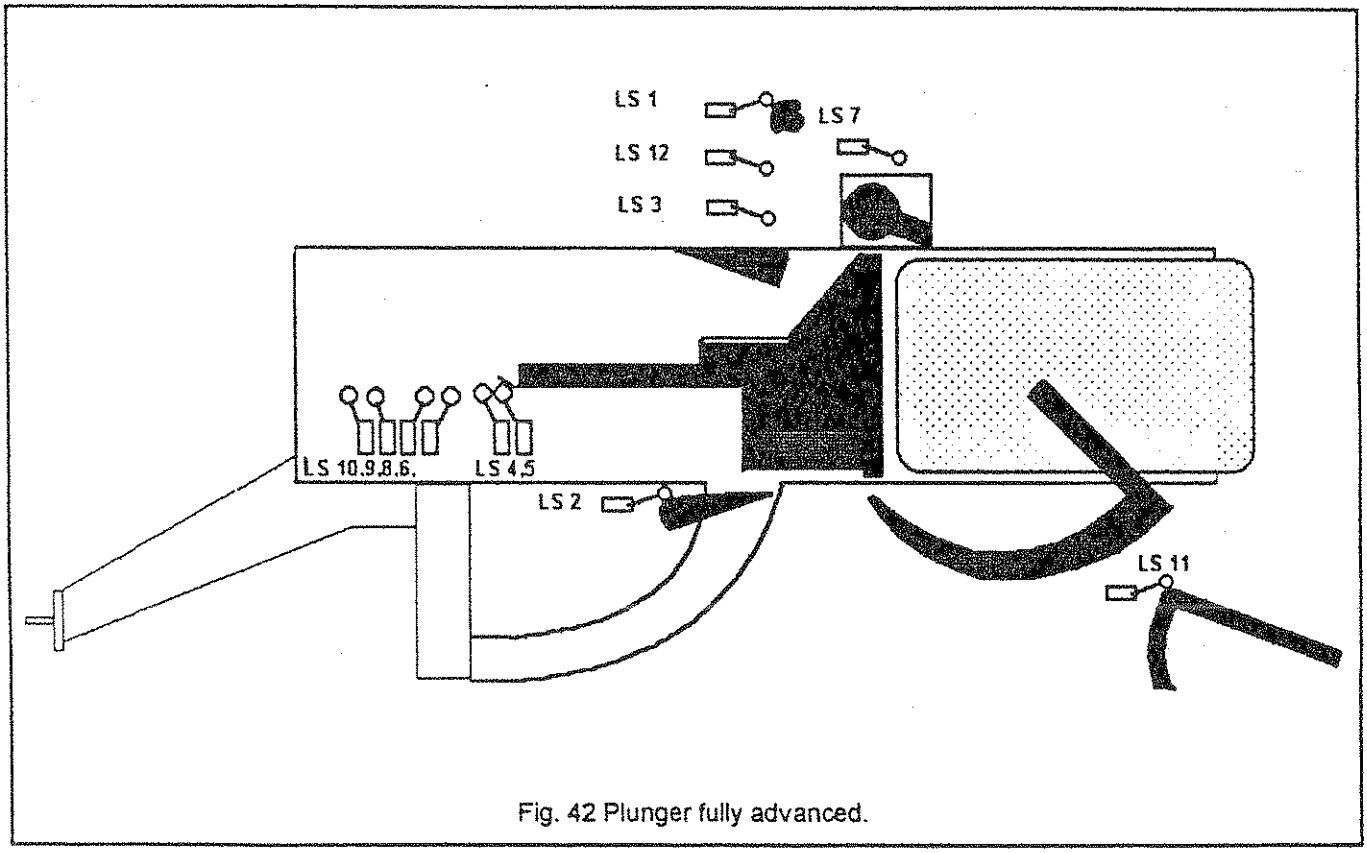
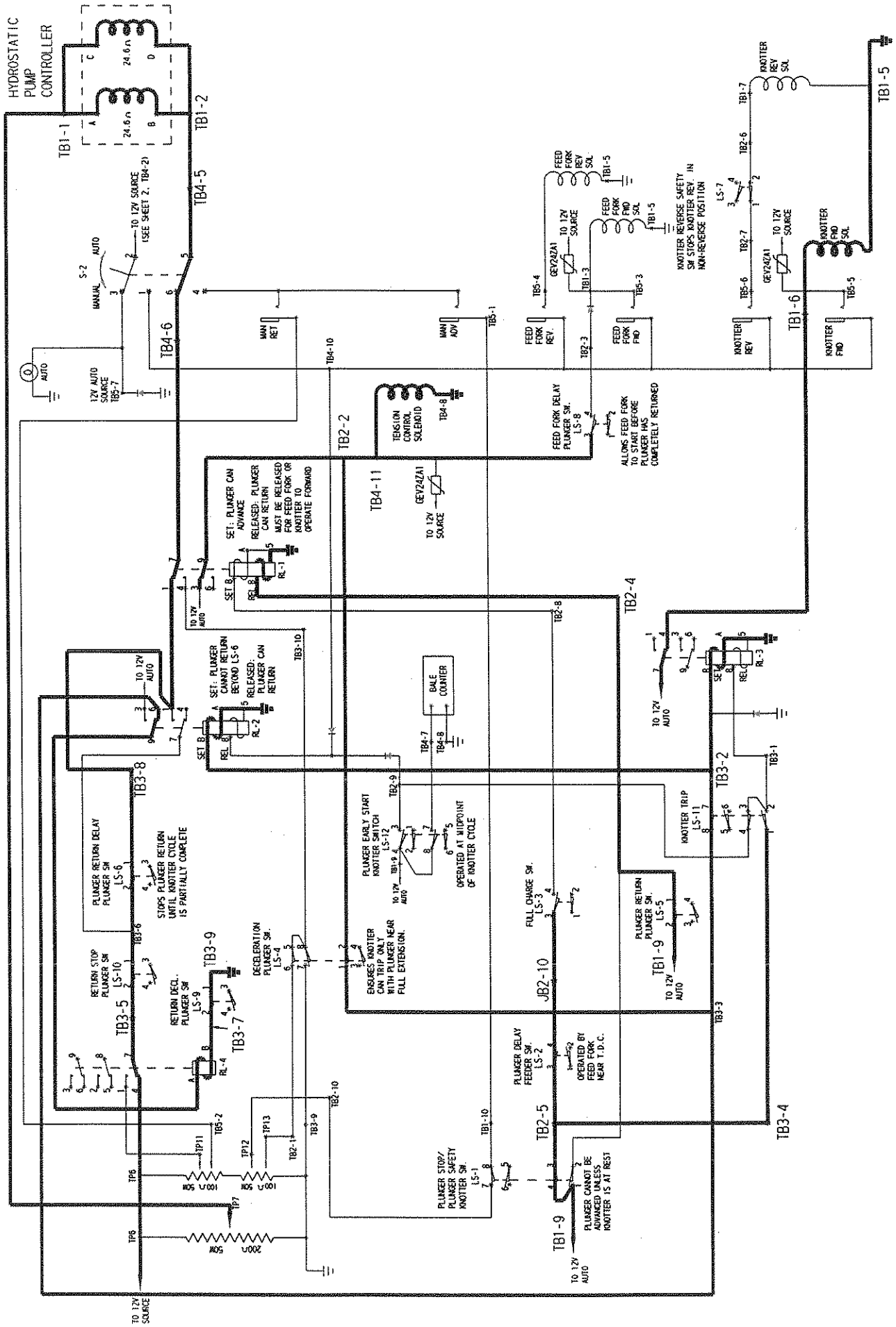


Fig. 42 Plunger fully advanced.

PLUNGER FULLY ADVANCED DURING A KNOTTER TIE CYCLE



PLUNGER RETRACT DURING TIE CYCLE

As the needle yoke moves away from the home position LS 1 is released. This provides current to Relay 1 to hold it in the released position. The meter arm is reset and LS 11 is released. The knotter continues to operate because Relay 3 is magnetically latched in the set position. As the plunger retracts the following switches are operated in sequence:

A. LS 5 is operated
B. LS 4 is operated which slows plunger retract to about 25% of full speed
C. LS 6 is operated. This stops plunger retract until the knotter has completed half of the tie cycle and LS 12 is released.

The purpose of stopping the plunger on the return stroke before the knotter has completed the first half of it's cycle is to assist knotter functions.

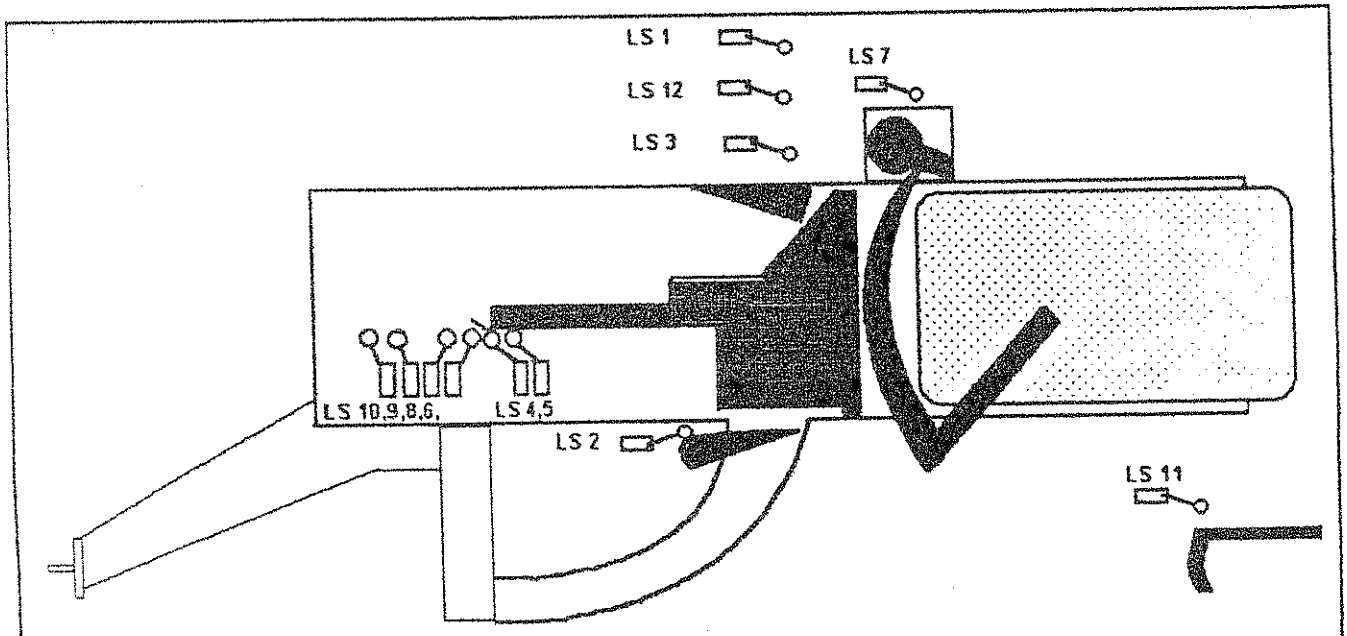
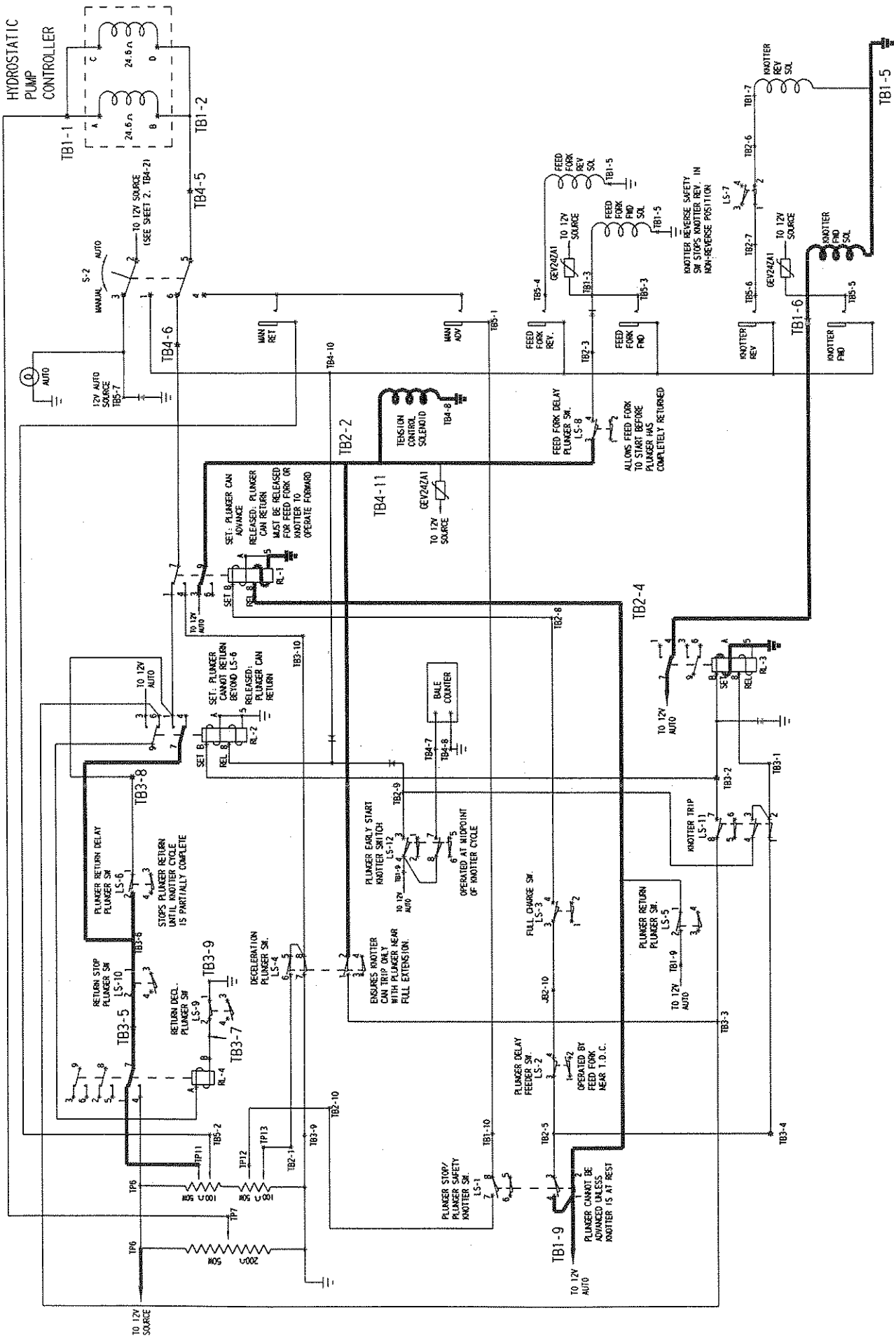


Fig. 43, Plunger stops at LS 6 during tie cycle.


HYDROSTATIC PUMP CONTROLLER
TB1-1
TB1-2
TB4-5
TB4-6
TB2-2
TB2-4
TB1-5
TB1-6
TB1-9
TB4-11
TB3-5
TB3-7
TB3-8
TB3-9
TO 12V SOURCE (SEE SHEET 2, TB4-2)
MANUAL
AUTO
S-2
12V AUTO SOURCE TB5-7
MAIN RET
MAIN ADV
TB4-10
TB5-1
TENSION CONTROL SOLENOID
TB4-8
GEV24ZA1
TO 12V SOURCE
SET: PLUNGER CAN ADVANCE
RELEASED: PLUNGER CAN RETURN
MUST BE RELEASED FOR FEED FORK OR KNOTTER TO OPERATE FORWARD
SET
REL
RL-1
SET: PLUNGER CANNOT RETURN BEYOND LS-6
RELEASED: PLUNGER CAN RETURN
RL-2
BALE COUNTER
TB4-7
TB4-8
FEED FORK REV.
FEED FORK FWD
FEED FORK REV SOL
FEED FORK FWD SOL
TB5-4
TB5-3
TB2-3
FEED FORK DELAY PLUNGER SW. LS-8
ALLOWS FEED FORK TO START BEFORE PLUNGER HAS COMPLETELY RETURNED
KNOTTER REVERSE SAFETY SW STOPS KNOTTER REV. IN NON-REVERSE POSITION
KNOTTER REV
KNOTTER FWD
KNOTTER REV SOL
KNOTTER FWD SOL
TB5-6
TB5-5
TB2-6
TB2-7
TB1-7
LS-7
PLUNGER RETURN DELAY PLUNGER SW LS-6
STOPS PLUNGER RETURN UNTIL KNOTTER CYCLE IS PARTIALLY COMPLETE
RETURN STOP PLUNGER SW LS-10
RETURN DECEL PLUNGER SW LS-9
DECELERATION PLUNGER SW. LS-4
PLUNGER EARLY START KNOTTER SWITCH LS-12
ENSURES KNOTTER CAN TRIP ONLY WITH PLUNGER NEAR FULL EXTENSION
OPERATED AT MIDPOINT OF KNOTTER CYCLE
FULL CHARGE SW. LS-3
PLUNGER RETURN PLUNGER SW. LS-5
KNOTTER TRIP LS-11
PLUNGER DELAY FEEDER SW. LS-2
OPERATED BY FEED FORK NEAR T.D.C.
PLUNGER STOP/ PLUNGER SAFETY KNOTTER SW. LS-1
PLUNGER CANNOT BE ADVANCED UNLESS KNOTTER IS AT REST
TO 12V AUTO
TO 12V SOURCE
TP6
TP7
TP11
TP12
TP13
100Ω 50W
200Ω 50W

RESUME PLUNGER RETRACT

At a point halfway through the tie cycle, LS 12 is operated which releases Relay 2 and allows the plunger to return at full speed. LS 12 also allows current to reach the bale counter.

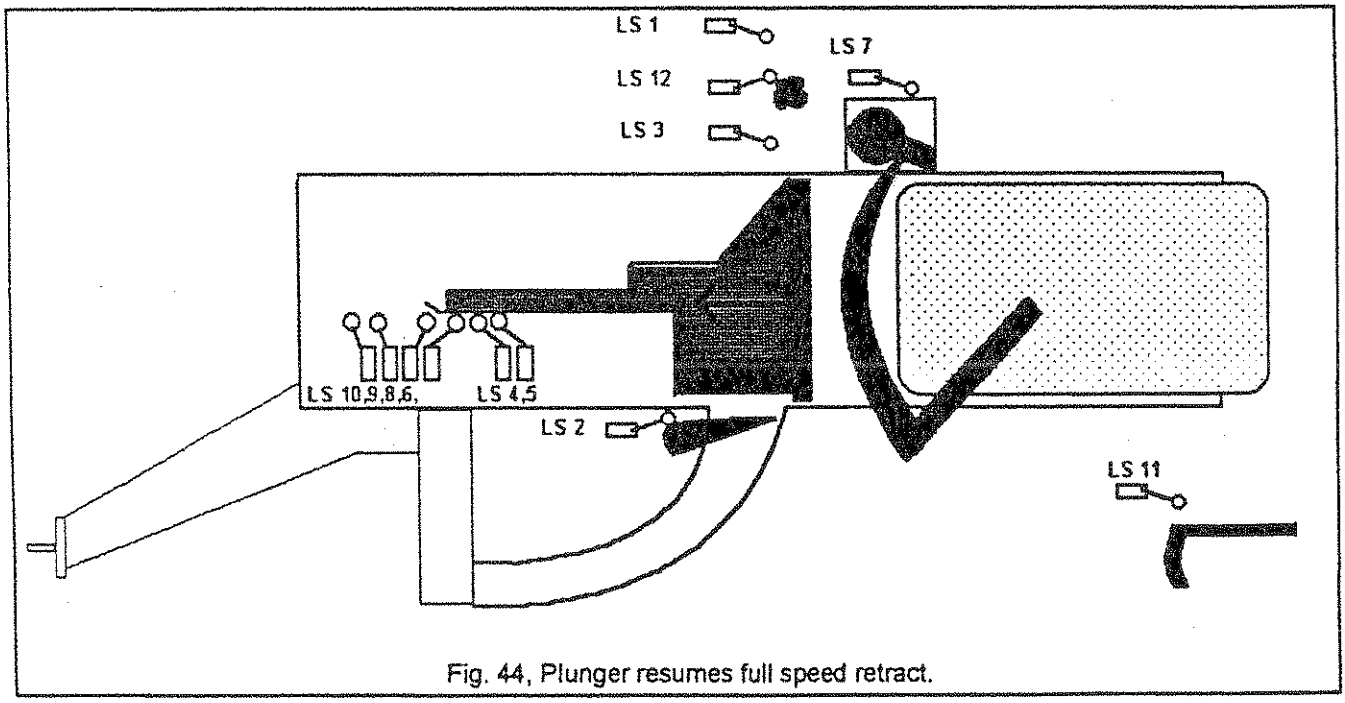
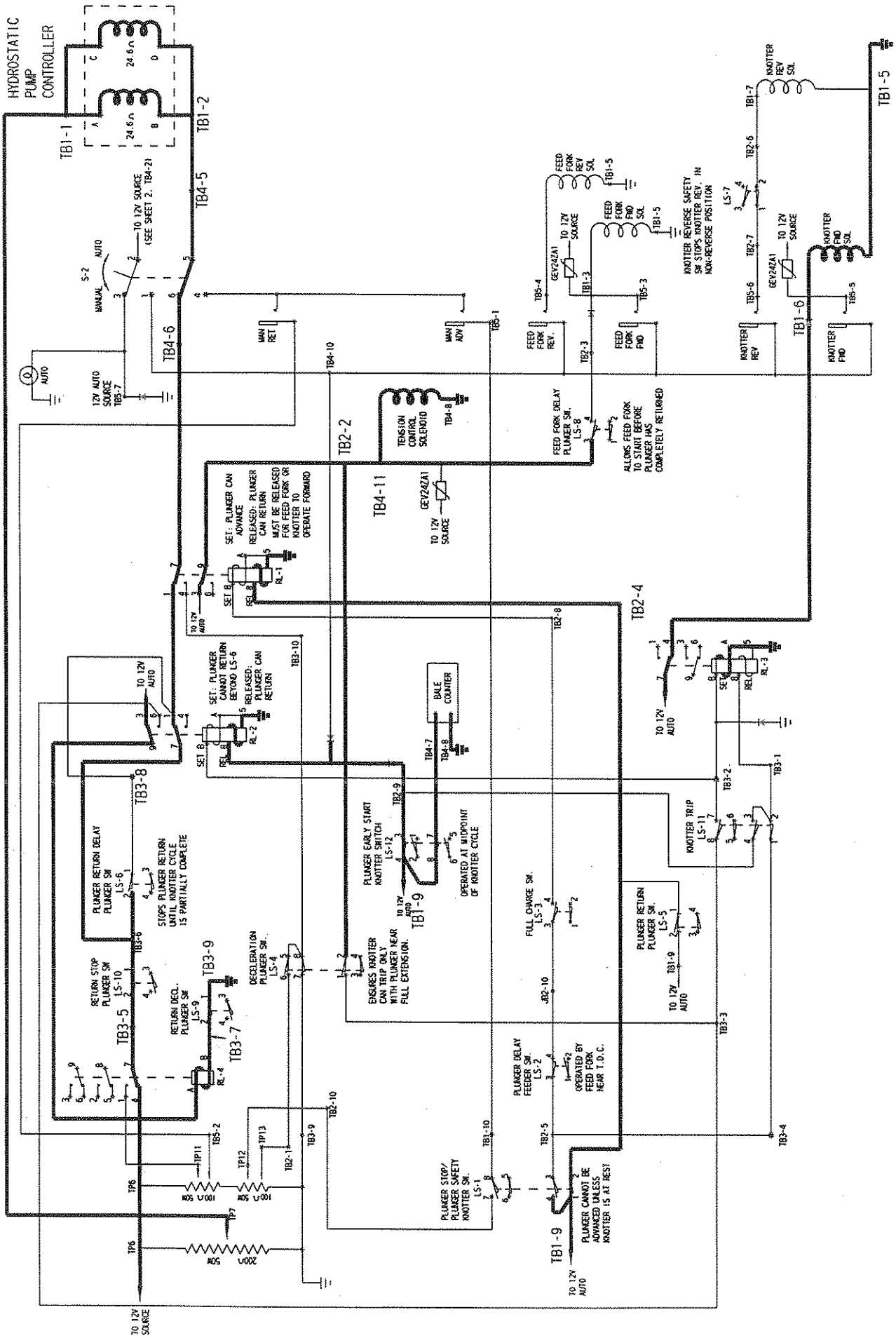


Fig. 44, Plunger resumes full speed retract.

KNOTTER ACTIVATES LS-12 PLUNGER RESUMES FULL SPEED RETRACT



PLUNGER RETRACT DURING LAST HALF OF TIE CYCLE

A. The Knotter continues to cycle until LS 1 is operated. This releases RL 3 and stops the knotter.
B. LS 8 is operated which causes feed fork to start.
C. LS 9 is operated. This opens the circuit to release Relay 4 and causes the plunger to slow to about 25% of full speed.

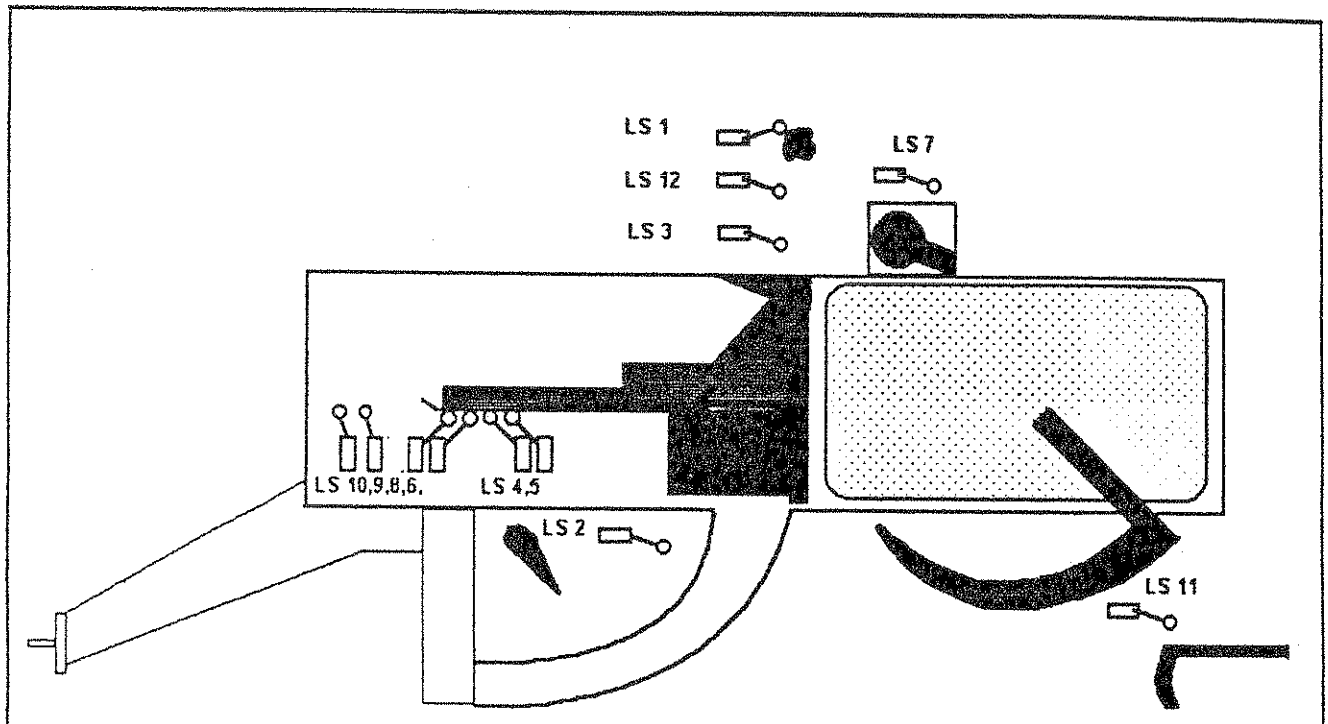


Fig. 45, LS 8 is operated.

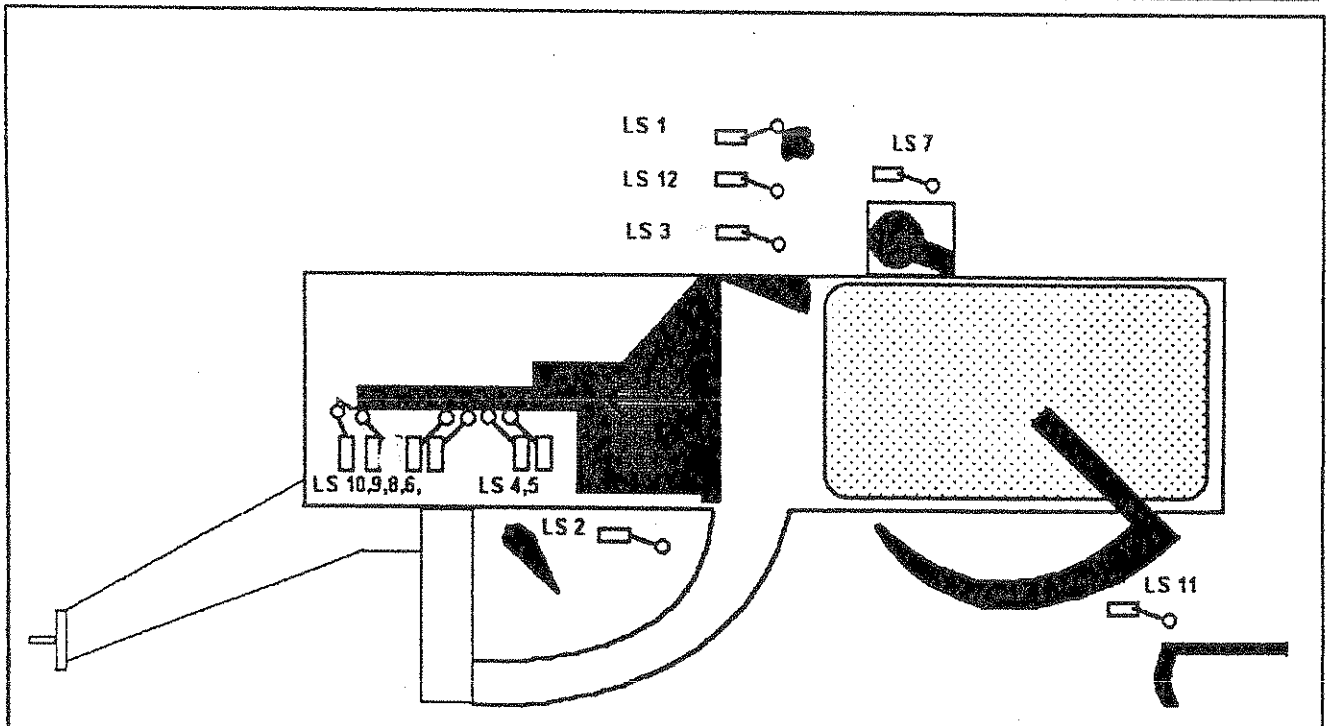
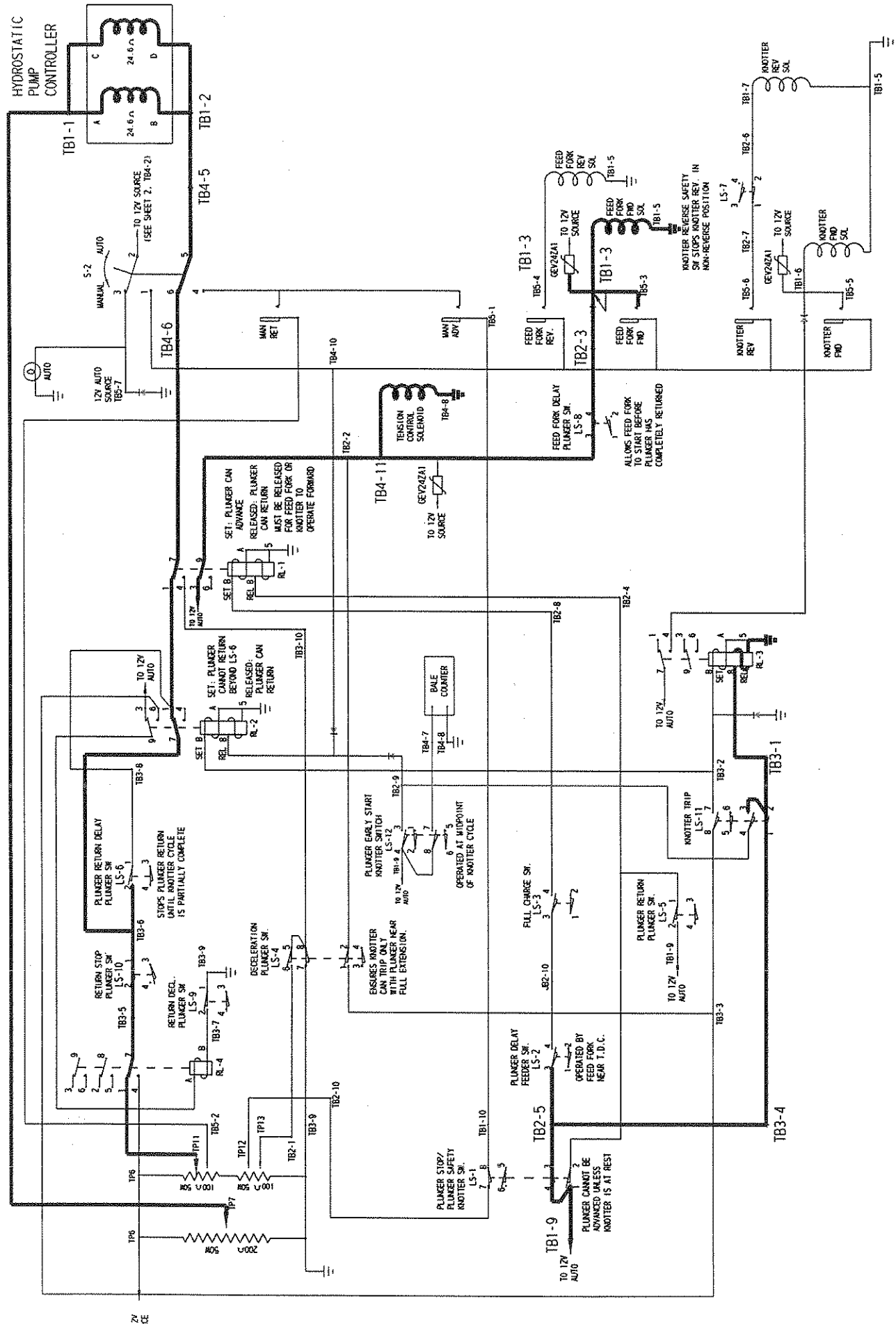


Fig. 46 LS 9 is operated.

KNOTTER ACTIVATES LS-1, FEEDFORK STARTS, PLUNGER DECELERATED RETRACT



PLUNGER FULLY RETRACTED

LS 10 is operated. This stops the plunger retract.

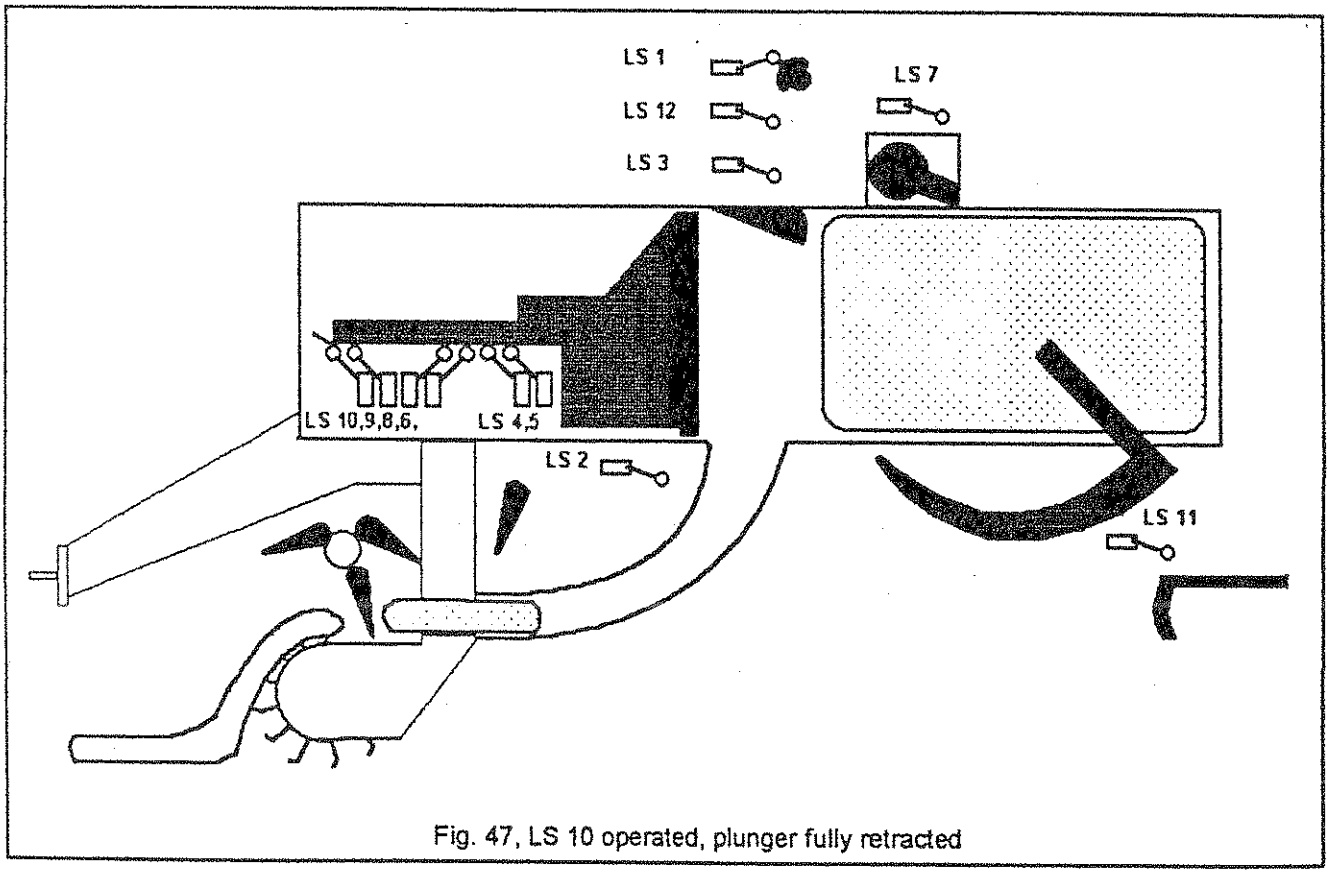
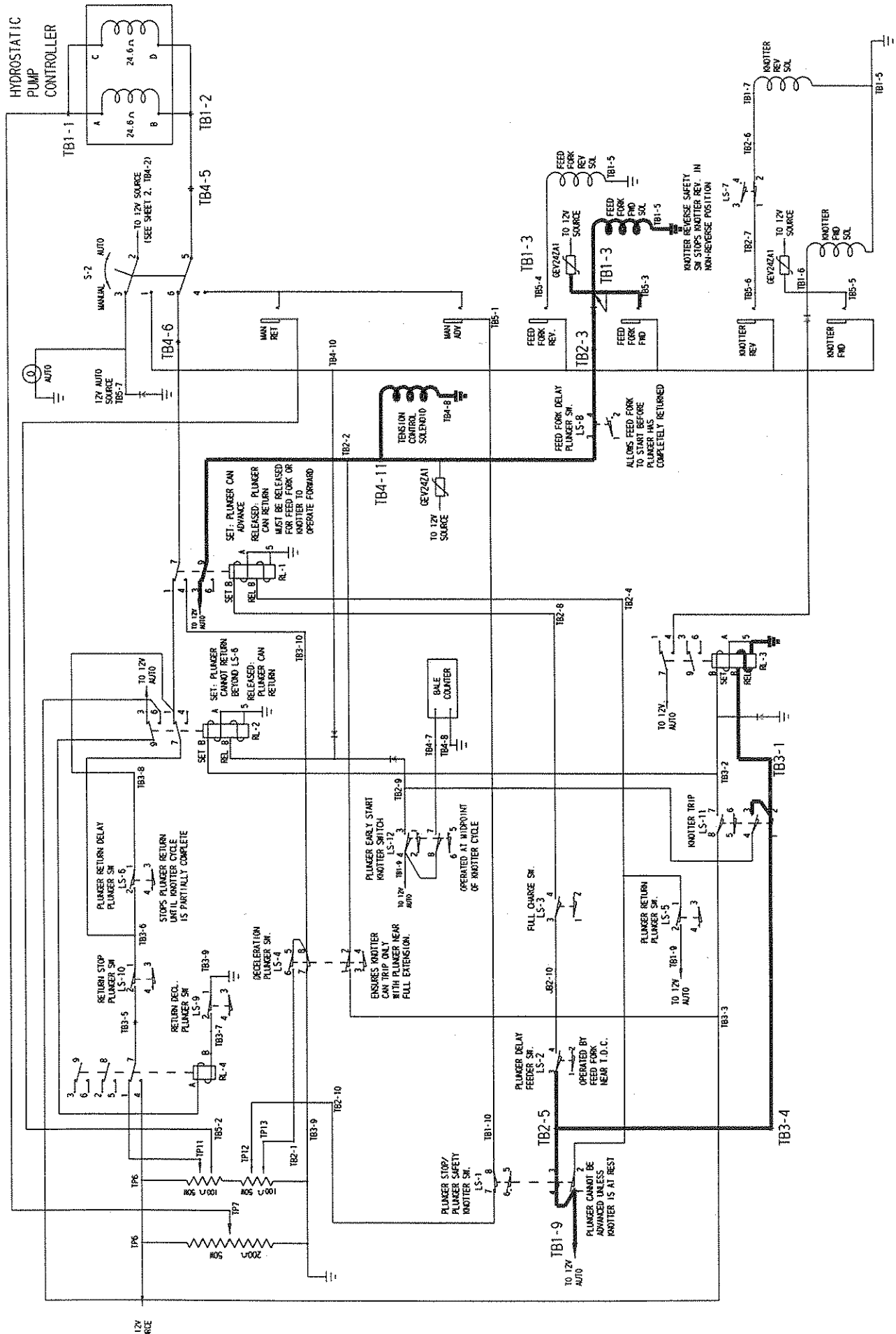


Fig. 47, LS 10 operated, plunger fully retracted


HYDROSTATIC PUMP CONTROLLER
TB1-1
TB1-2
TB4-5
TB4-6
TB4-10
TB4-11
TB2-1
TB2-2
TB2-3
TB2-4
TB2-5
TB2-6
TB2-7
TB2-8
TB2-9
TB2-10
TB3-1
TB3-2
TB3-3
TB3-4
TB3-5
TB3-6
TB3-7
TB3-8
TB3-9
TB3-10
TB5-1
TB5-2
TB5-3
TB5-4
TB5-5
TB5-6
TB5-7
TB1-3
TB1-5
TB1-6
TB1-7
TB1-9
TB1-10
TO 12V SOURCE (SEE SHEET 2, TB4-2)
S-2
MANUAL
AUTO
12V AUTO SOURCE TB5-7
MAN RET
MAN ADV
TENSION CONTROL SOLENOID
TB4-8
GEV242A1
TO 12V SOURCE
SET: PLUNGER CAN ADVANCE
RELEASED: PLUNGER CAN RETURN
MUST BE RELEASED FOR FEED FORK OR KNOTTER TO OPERATE FORWARD
SET B
REL B
RL-1
RL-2
RL-3
RL-4
SET: PLUNGER CANNOT RETURN BEYOND LS-6
RELEASED: PLUNGER CAN RETURN
BALE COUNTER
FEED FORK REV.
FEED FORK FWD
FEED FORK REV SOL
FEED FORK FWD SOL
FEED FORK DELAY PLUNGER SW. LS-8
ALLOWS FEED FORK TO START BEFORE PLUNGER HAS COMPLETELY RETURNED
KNOTTER REV
KNOTTER FWD
KNOTTER REV SOL
KNOTTER FWD SOL
KNOTTER REVERSE SAFETY SW STOPS KNOTTER REV. IN NON-REVERSE POSITION
PLUNGER RETURN DELAY PLUNGER SW LS-6
STOPS PLUNGER RETURN UNTIL KNOTTER CYCLE IS PARTIALLY COMPLETE
RETURN STOP PLUNGER SW LS-10
RETURN DECL. PLUNGER SW LS-9
DECELERATION PLUNGER SW. LS-4
PLUNGER EARLY START KNOTTER SWITCH LS-12
ENSURES KNOTTER CAN TRIP ONLY WITH PLUNGER NEAR FULL EXTENSION.
OPERATED AT WIDPOINT OF KNOTTER CYCLE
FULL CHARGE SW. LS-3
PLUNGER RETURN PLUNGER SW. LS-5
KNOTTER TRIP LS-11
PLUNGER DELAY FEEDER SW. LS-2
OPERATED BY FEED FORK NEAR T.D.C.
PLUNGER STOP/ PLUNGER SAFETY KNOTTER SW. LS-1
PLUNGER CANNOT BE ADVANCED UNLESS KNOTTER IS AT REST
TO 12V AUTO
TO 12V SOURCE
TP6
TP7
TP11
TP12
TP13
100Ω
200Ω
50W

CIRCUIT ACTIVETY DURING MANUAL OPERATION

Operating the control circuit in the manual mode eliminates the control functions of all the limit switches with exception of LS 1 and LS 7. Information can be gained in trouble shooting the baler by operating the various components in the manual mode. 12 volt power is provided to the control box through the main switch and a 10 amp fuse. In order for current to reach the control circuit a thermostatic switch (opens on hot oil), and an oil level switch (opens on low oil), carry current to a relay. When the relay is set current is provided to the control circuit. See diagram on page 16, fig. 22, section B
The basic requirements for operation of the control circuit are a power source and oil of sufficient quantity in satisfactory condition. With these needs met manual operation of the components is possible.

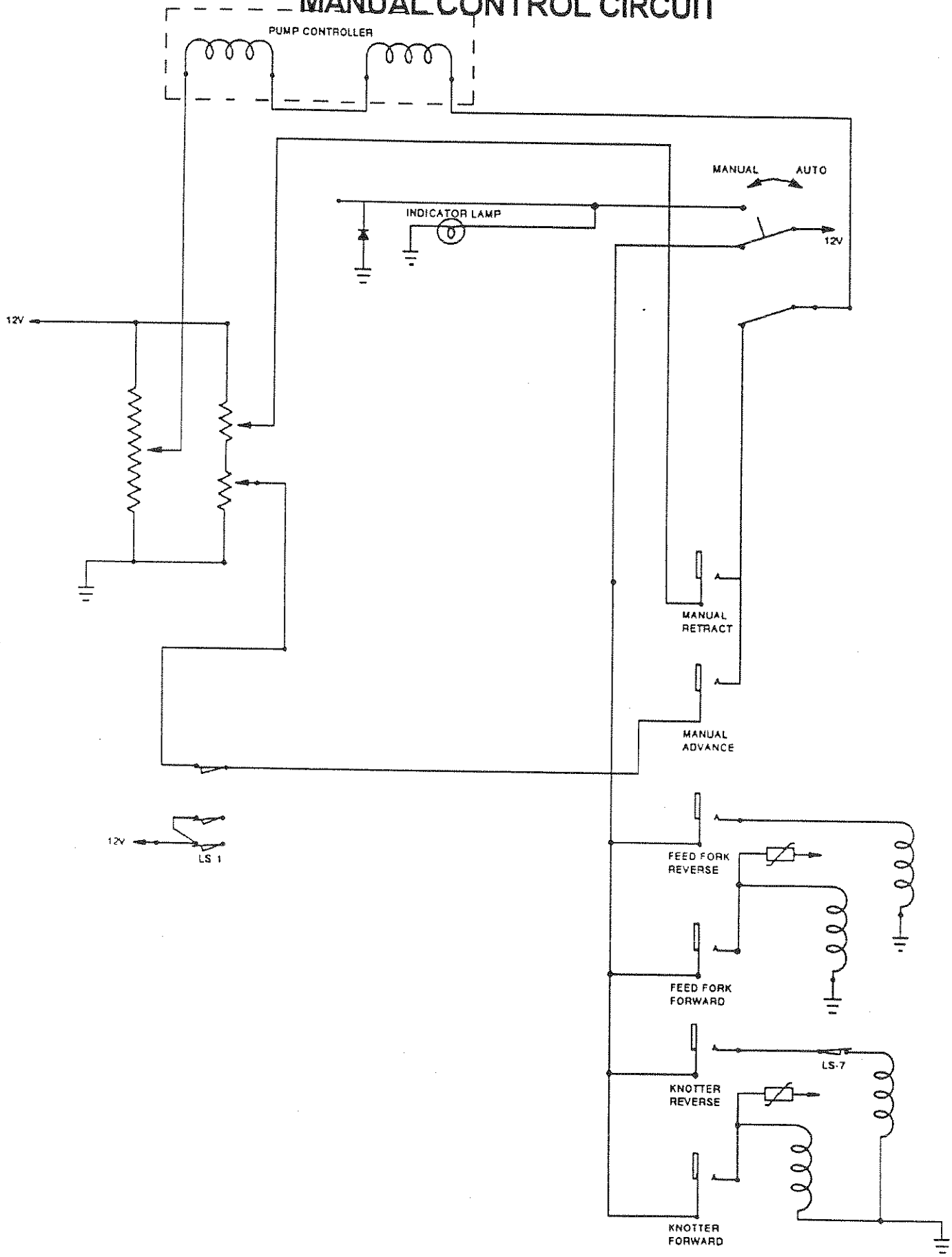
MANUAL PLUNGER OPERATION

LS 1 provides protection for the needles. The plunger will not advance in manual or automatic mode if LS 1 is not operated. If the plunger fails to advance for any reason check the condition of LS 1. Manual operation of the plunger in the retract mode is not affected by LS 1.

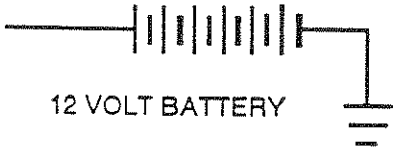
MANUAL FEED FORK AND KNOTTER OPERATION

The feed fork and knotter can be operated with the plunger in any position.
LS 7 prevents the knotter from being operated in reverse at those points where the bill hook would rotate.

MANUAL CONTROL CIRCUIT



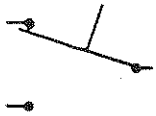
SYMBOLS



12 VOLT BATTERY

FUSE

CIRCUIT BREAKER

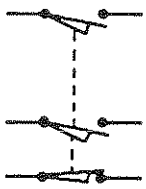


MANUALY OPERATED SWITCH

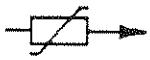
THERMAL SWITCH

FLOAT OPERATED SWITCH

INDICATOR LAMP

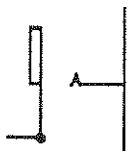


LIMITSWITCH



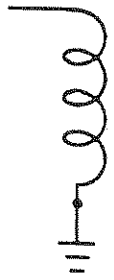
SURGE SUPRESSOR

DIODE

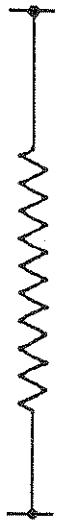


PHONE JACK

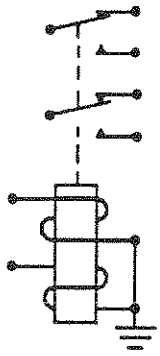
MOTOR



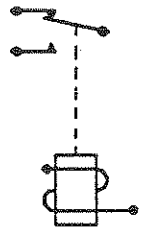
SOLENOID COIL



RESISTOR



MAGNETIC LATCHING RELAY



STANDARD RELAY

FREEMAN 1592 BIG BALER HYDRAULIC SYSTEMS

Contents

FREEMAN 1592 BIG BALER HYDRAULIC SYSTEMS

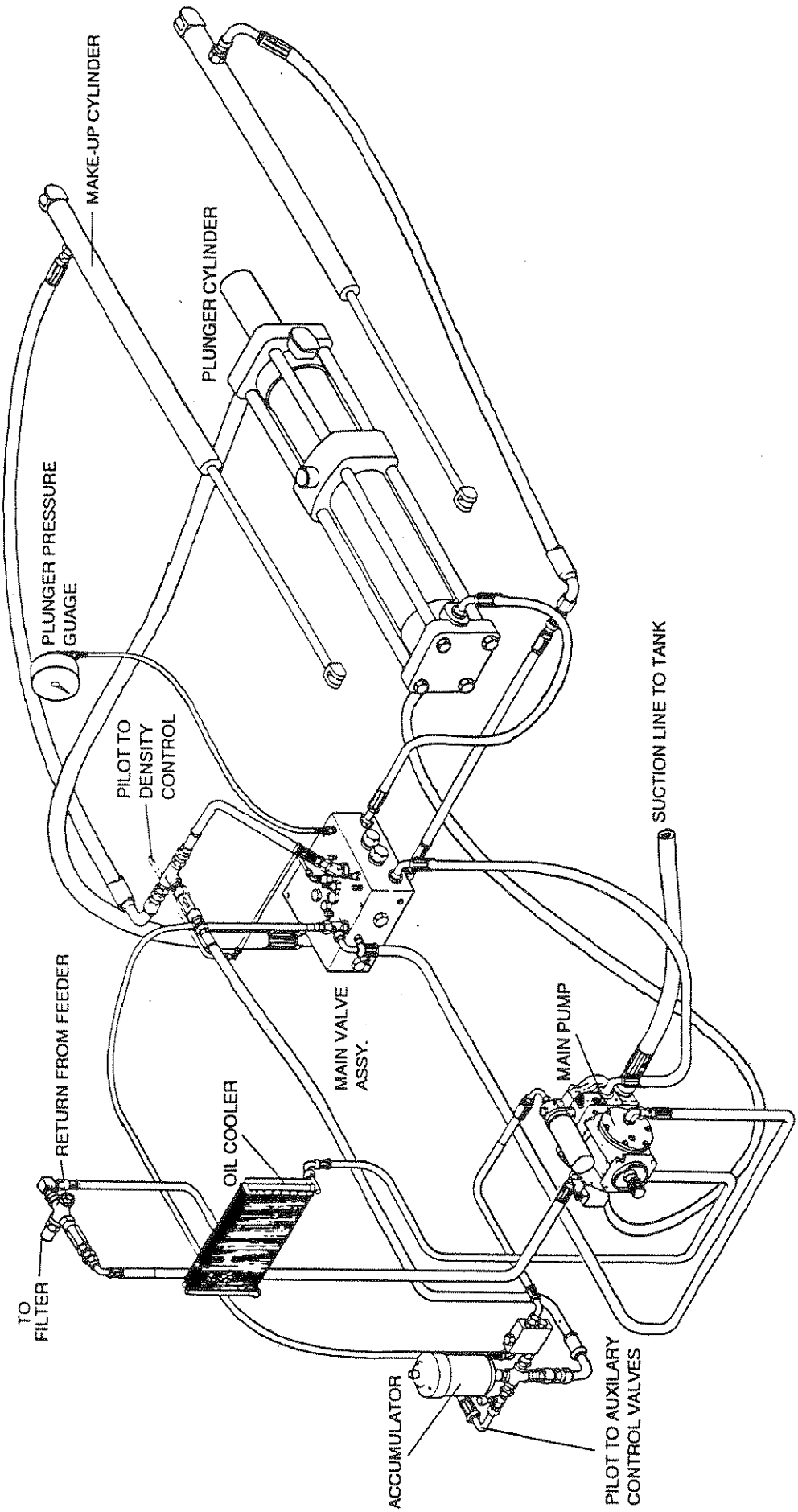
Three hydraulic systems on the 1592 baler convert tractor power into force used to compress crops or field residue into a dense, uniform package. The use of hydraulic components greatly reduce maintenance time when compared to conventional mechanical baling systems. The electrically controlled hydraulic systems make the baler easy to operate. Bale uniformity is greatly improved over conventional mechanical systems because of the machines ability to react to the volume of material being fed into the baler. Hydraulic functions are carried out by a Main system, an Auxiliary system and a Density control system.

MAIN SYSTEM

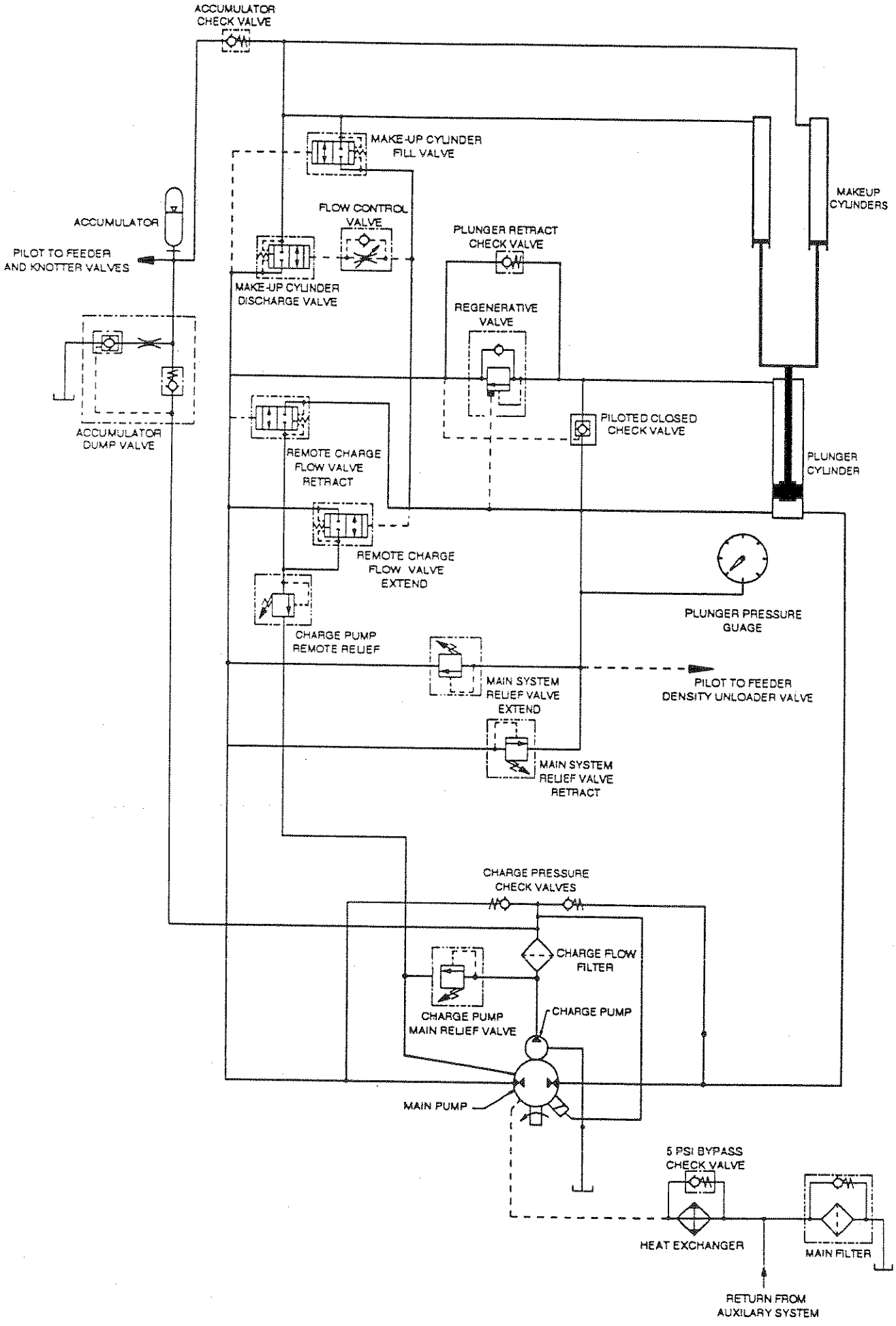
The main system uses a hydrostatic transmission capable of producing 80 gallons per minute to extend and retract the plunger cylinder. The hydrostatic transmission used on the 1592 baler is much like those used with ground propulsion units on combines, swathers and construction equipment. In this application a hydraulic cylinder is rapidly extended and retracted rather than creating rotary motion as in the case of propulsion units. Electric signals from the main control circuit activate a displacement control valve which directs pump output to extend or retract the main cylinder. The necessary control valves are cartridge type contained in a single manifold. Manual control of the main plunger drive circuit is provided through the main control box.

The main hydraulic system is a basic closed loop circuit. A fixed displacement charge pump is installed in the variable displacement pump and driven off the main pump shaft. The charge pump supplies cool fluid to the system, keeps the system charged, and supplies fluid to operate the control system. Charge pump flow exits the system and circulates through a heat exchanger before being filtered and returning to the reservoir. The charge system maintains 350 to 400 PSI on the entire system. Charge system oil circulates through the charge flow filter, the 400 PSI charge system relief and back to the reservoir.

Because pump input must equal pump output in a closed system, compensation must be made for the different displacement of the rod end of the main cylinder as compared to the base end. During plunger advance the pump fills the base end of the cylinder with oil. As it extends a smaller volume of oil is being forced out of the rod end and returning to the pump. If no other means existed to equalize the input and output flow, the charge system would have to add oil rapidly to the closed loop to compensate for the imbalance. Because this is not practical, two Make Up cylinders are added to the system. They act as reservoir to provide extra oil flow to the suction side of the pump thus balancing pump output volume with input volume. When the main system is repeatedly cycled as during baling; brief deficiencies occur in the system. A gas charged accumulator maintains pressure on the system in conjunction with the charge system. A check valve protects the accumulator from high pressures in the system. The following section traces the hydraulic flow through the system during the various stages of operation.


MAKE-UP CYLINDER
PLUNGER CYLINDER
PLUNGER PRESSURE GUAGE
PILOT TO DENSITY CONTROL
SUCTION LINE TO TANK
RETURN FROM FEEDER
MAIN VALVE ASSY.
MAIN PUMP
OIL COOLER
TO FILTER
ACCUMULATOR
PILOT TO AUXILARY CONTROL VALVES

MAIN SYSTEM HYDRAULIC SCHEMATIC



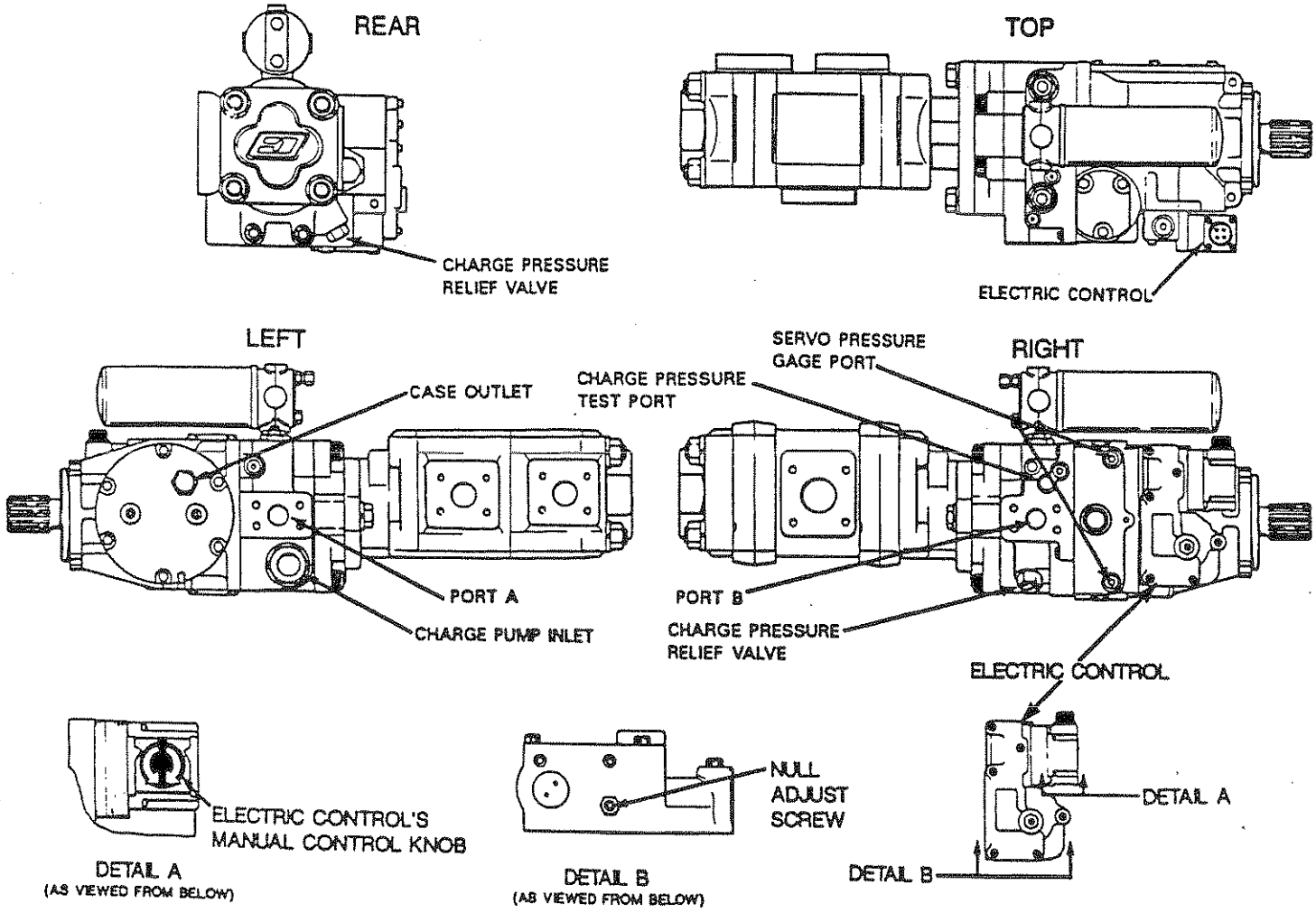
MAIN PUMP

The main pump is a variable displacement pump using the parallel axial piston/slipper design in conjunction with a tiltable cradle swashplate to vary the pump's displacement. Pump output is controlled by a hydro-mechanical, closed loop control system which is controlled by an electrical input signal. The pump includes the charge pump and associated valving to provide the necessary flow for makeup oil, to operate the control system, and provide cooling for the system. Charge pump relief pressure is set at 400 PSI.

ELECTRIC DISPLACEMENT CONTROL (Controller)

The electrical displacement control converts an electrical signal to a hydraulic signal to operate a spring centered 4-way servo valve which ports hydraulic pressure to either side of a double acting servo piston. The servo piston rotates the cradle swashplate thus varying the pump's displacement from full displacement in one direction to full displacement in the opposite direction.

During normal baling the control circuit automatically activates the conroller. Manual operation is possible with the use of the manual control pendant when connected to the control panel. On the pump itself is a mechanical manual control. Do not use this control for any purpose other than testing. Ensure the needles are in the home position before the activating the manual control. **MISUSE MAY CAUSE SERIOUS EQUIPMENT DAMAGE.**



MAIN VALVE

The main valve assembly contains control valves 2 through 12. These valves control the flow of hydraulic fluid and regulate pressures. These valves are cartridge type making them easily serviceable. Five ports are provided on the main valve assembly for the installation of test gauges.

GAUGE PORTS

A: Charge pressure
B: Main system retract pressure
C:. Plunger rod end pressure
D: Remote charge pressure
E: Make-up cylinder pressure

VALVE CARTRIDGES

2: Main system relief valve, retract: Sets maximum pressure for plunger retract.
3: Main system relief valve, extend: Sets maximum pressure for plunger extend.
4: Charge pump remote relief: Sets charge pressure while pump is in stroke.
5: Remote charge flow valve, extend: Connects remote charge relief to low pressure side of loop during plunger extend.
6: Remote charge flow valve, retract: Connects remote charge relief to low pressure side of loop during plunger retract.
7: Piloted closed check valve: Allows free flow for regenerative extension. Piloted closed for plunger retract.
8: Regenerative valve: Piloted to open at 1500 PSI during plunger extend. Controls regenerative extension
9: Make-up cylinder fill valve: Connects make-up cylinders to low pressure side of loop during plunger retract. Allows them to fill.
10: Make-up cylinder discharge valve: Connects make-up cylinders to low pressure side of loop during plunger advance. Allows them to discharge.
11: Flow control valve: Controls closing rate of make-up cylinder discharge valve.
12: Plunger retract check valve: supplements check valve in regenerative valve.

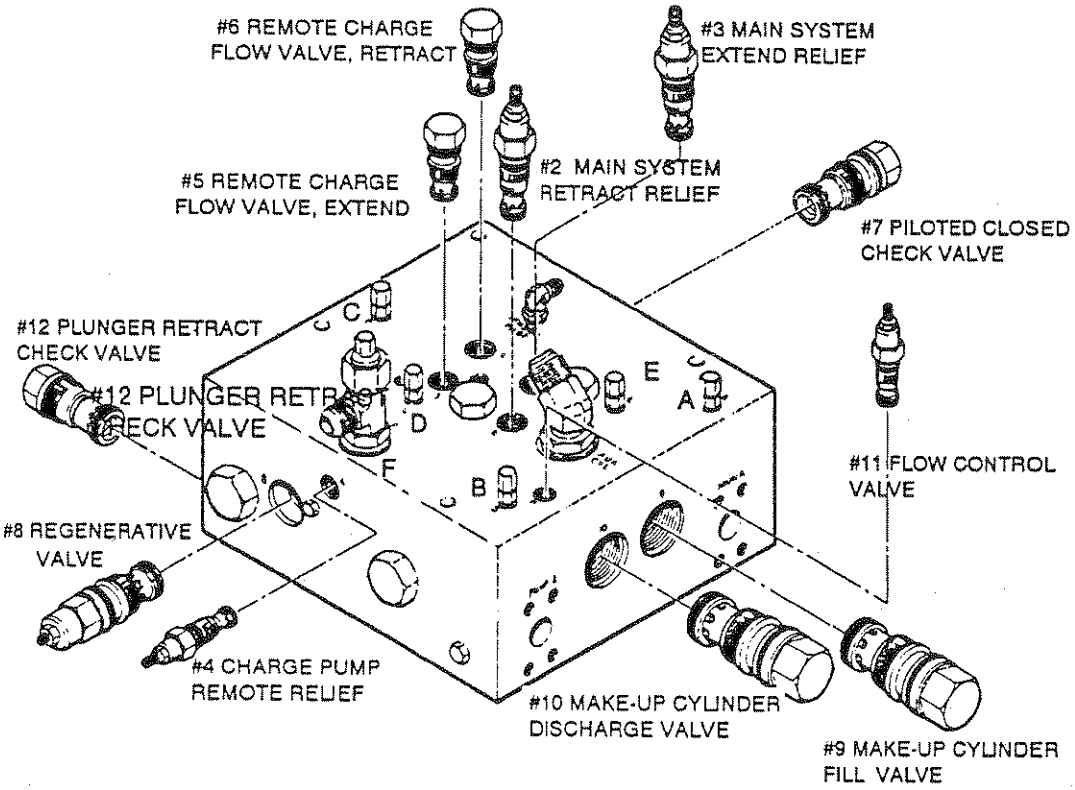
LOGIC VALVES

Valve cartridges 5, 6, 9, and 10 are Logic type switching valves. Logic valve cartridges are unbalanced poppet, two-way valves with a third port to control poppet operation. The unbalanced poppet can be operated: A) directly by pressure at either work port, or B) by pilot pressure from an external source.

NOTE: Because of their unbalanced poppet design, the operation of these cartridges is pressure dependent. The opening and closing movements of the poppet are functions of the force balances on three areas - port 1, port 2, and port 3.

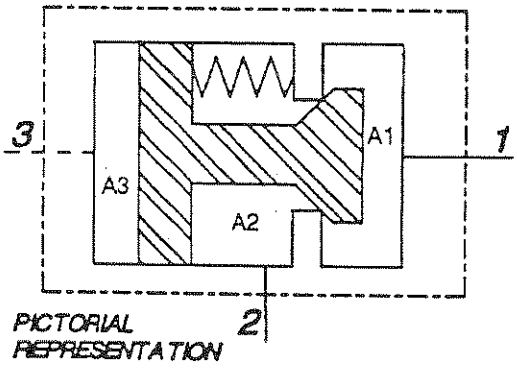
The illustration on the opposite page shows a representation of the valve. The illustration supports the following explanation.

Pressure at port 1 or port 2, acting on areas A1 or A2, plus the bias spring force, tends to close the valve or add to the closing force. Pilot pressure at port 3, acting on area A3, tends to open the valve. Pilot-to-open switching cartriages close when the forces affecting the surface areas at port 1 or port 2 are greater than the forces affecting the surface area at port 3. When port 3 is vented, the valve will close and remain closed regardless of the pressure at port 1 or port 2.
When pilot pressure is applied at port 3, this pressure, acting on A3 (minus the bias spring force), tends to open the valve. The valve may be closed by venting port 3 (pilot) to tank, or by introducing a proportionately higher pressure at port 1 or port 2.

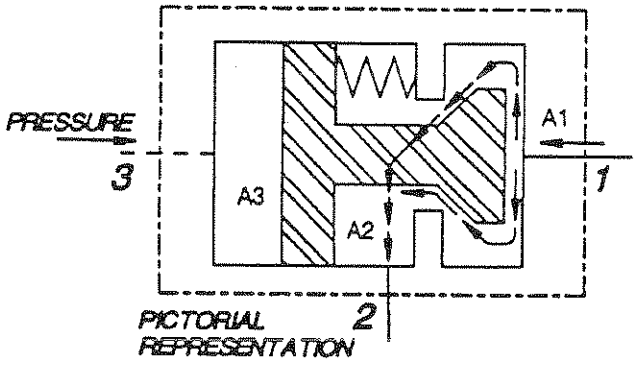


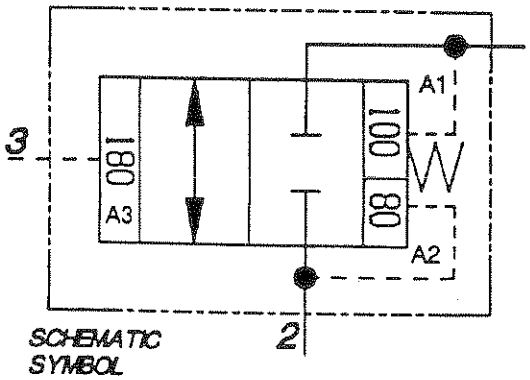
MAIN VALVE

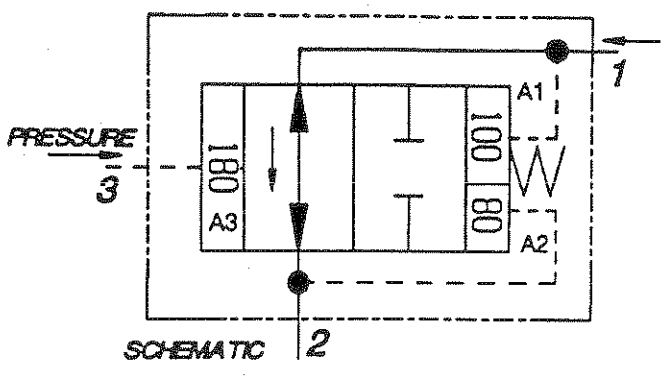
LOGIC VALVE CLOSED



LOGIC VALVE PILOTED OPEN

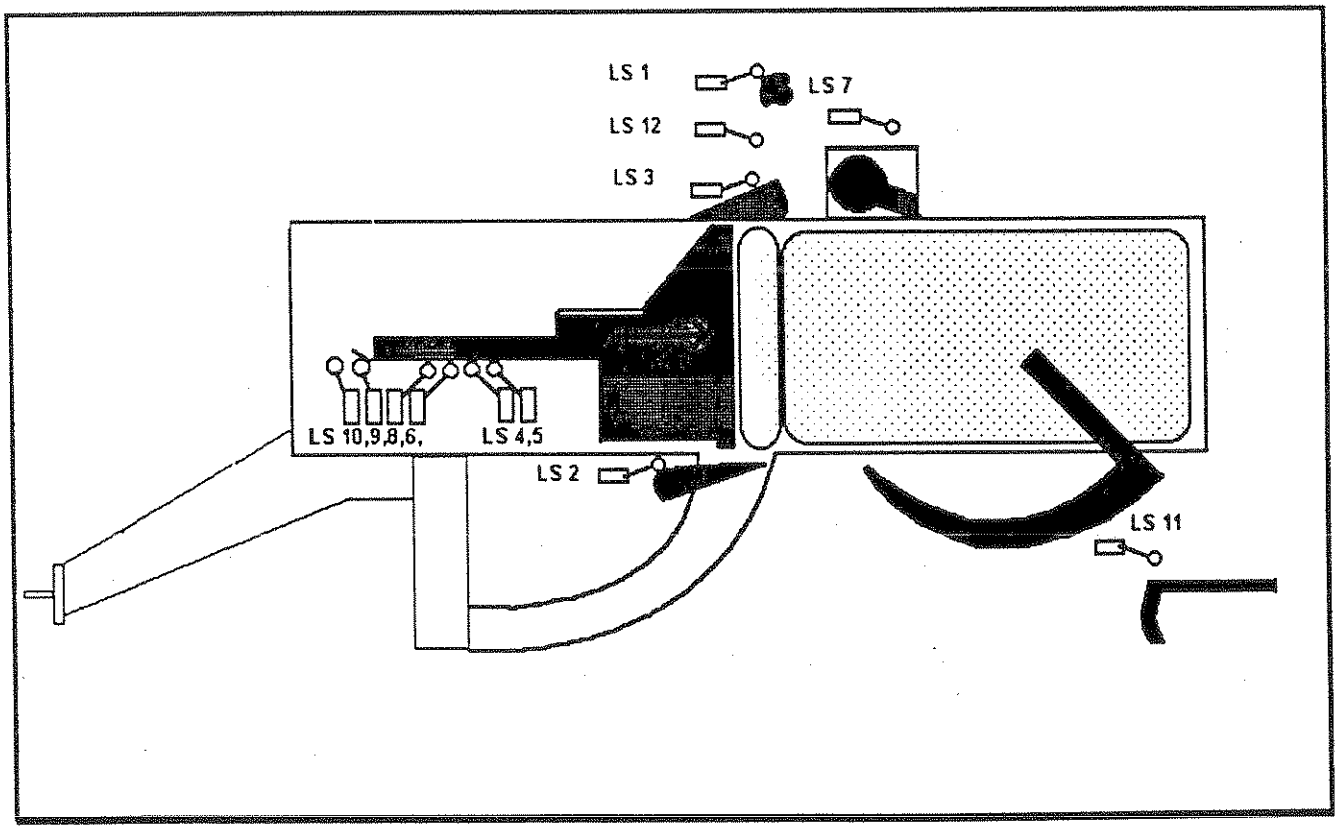


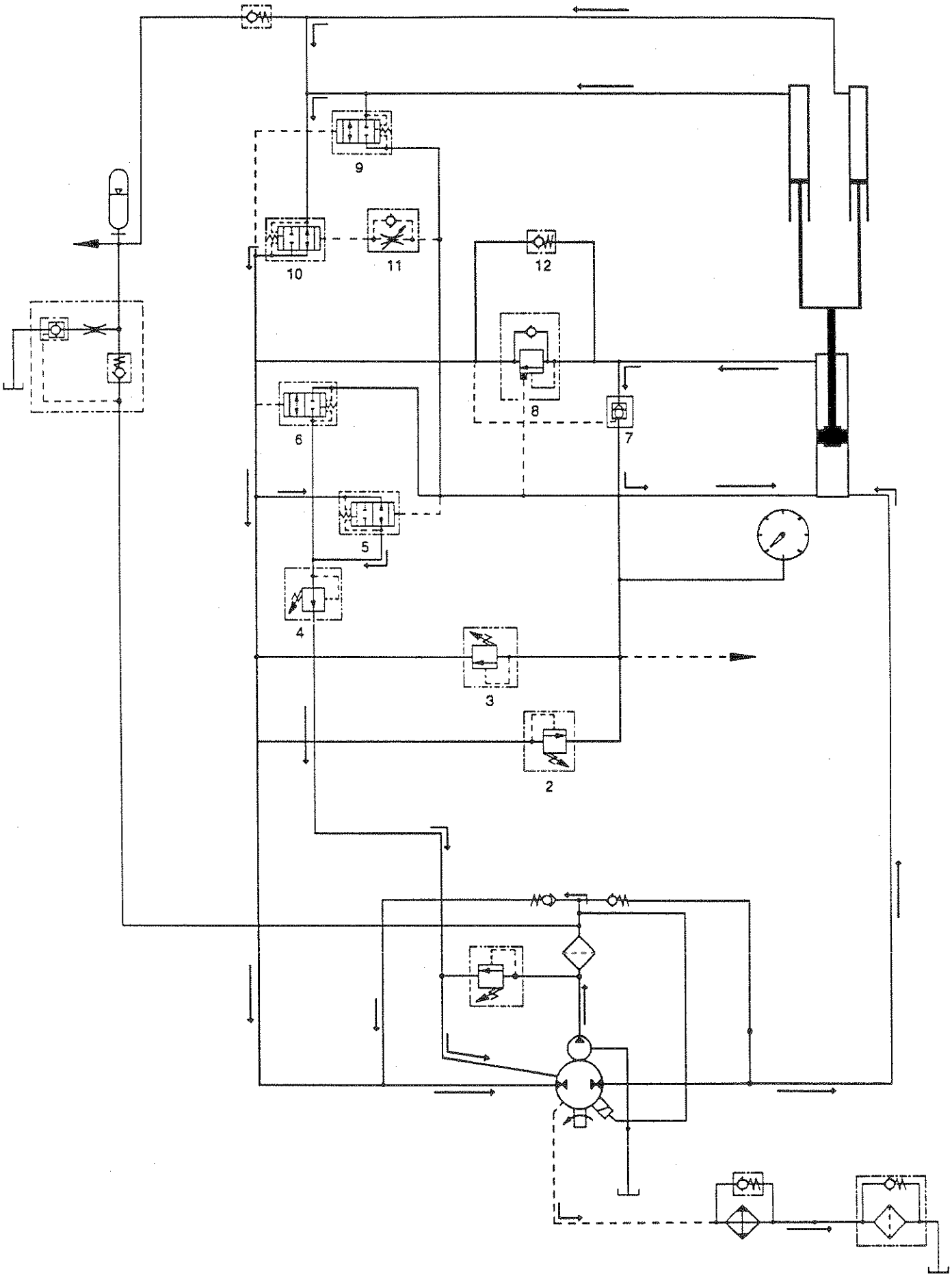




PLUNGER EXTEND, PHASE 1

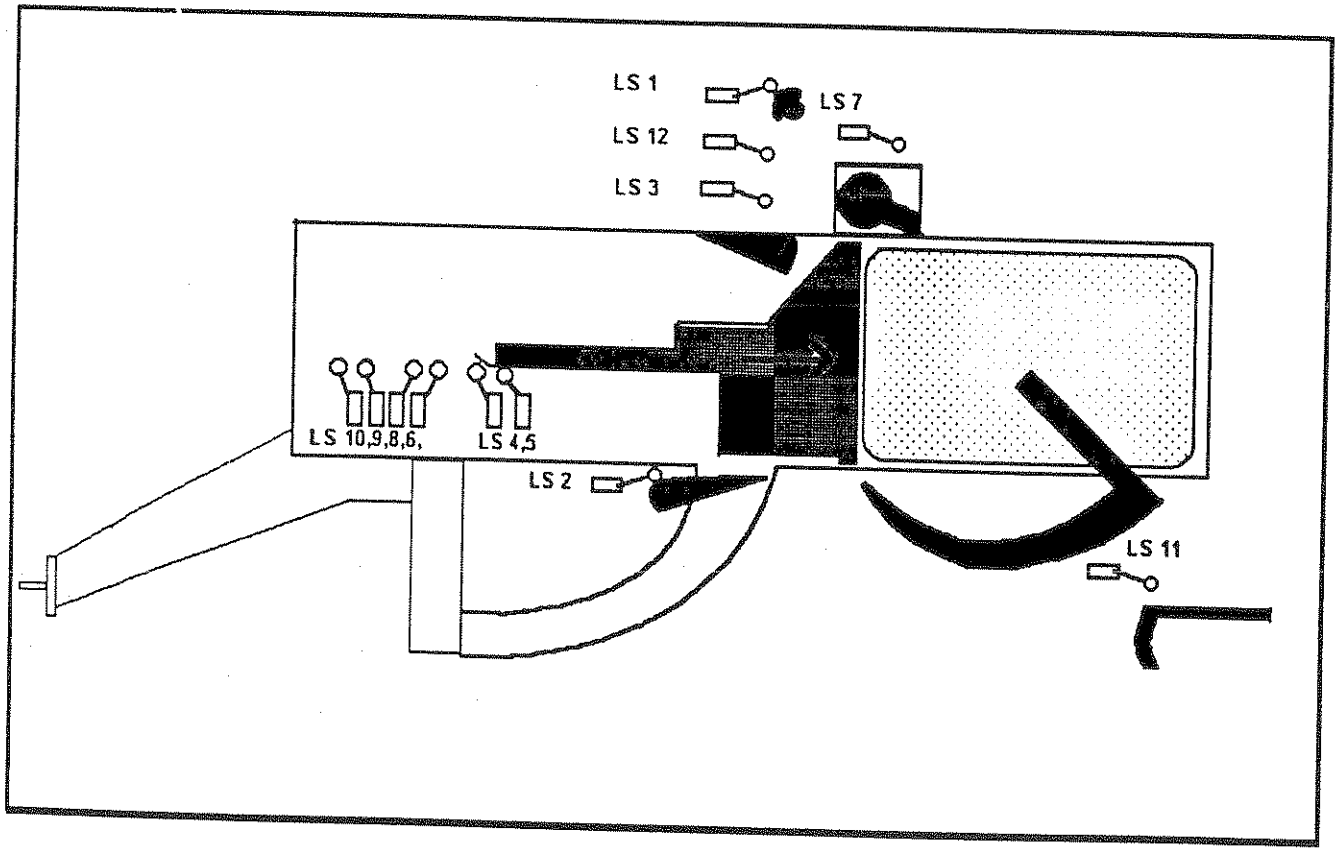
Electric current from the control box actuates the displacement control (Controller) and directs full pump output to the base end of the plunger cylinder. The plunger cylinder begins to extend. As the cylinder extends, fluid from the rod end is forced out. This fluid is routed back to the base end through the No. 7 check valve. This is called regenerative extension. The regenerative process allows for faster cylinder extension at low output pressure. Simultaneously fluid from the base end of the make up cylinders is forced out and returned to the suction side of the pump. Pilot pressure from the base end of the main cylinder opens the remote charge flow valve No. 5. Charge pressure is then able to flush oil from the circuit for cooling and filtering. Charge system relief pressure is now regulated by the charge pump remote relief valve No. 4. (instead of charge pump main relief).

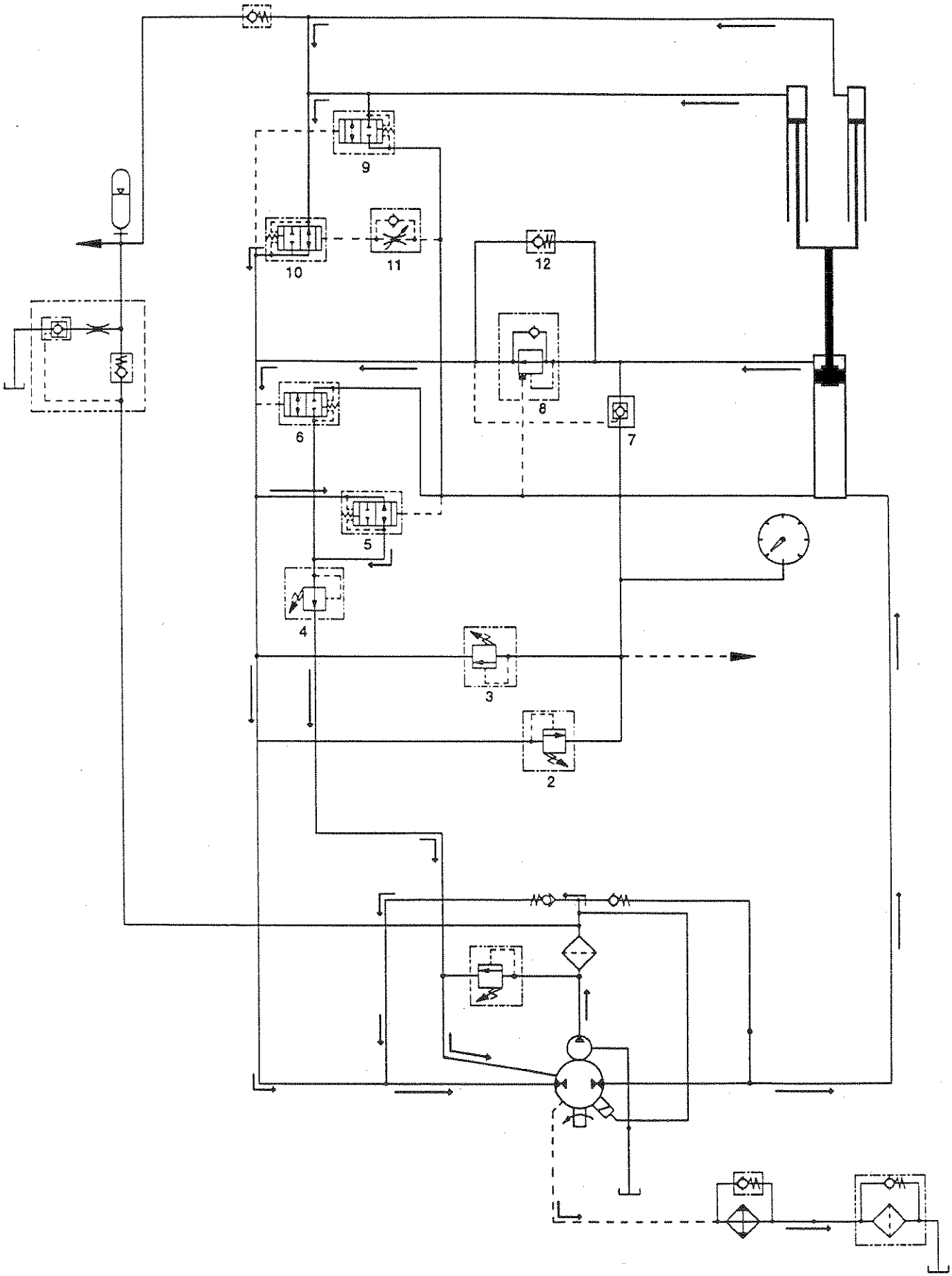



9
10
11
12
8
7
6
5
4
3
2

PLUNGER EXTEND PHASE 2

As the plunger advances to compress the product more pressure is applied to the base end of the main cylinder. When the pressure reaches 1500 PSI Regenerative valve No. 8 is piloted open. This allows rod end fluid to return to the suction side of the pump. Pressure differential between the base end and the rod end closes check valve No. 7. Near the end of the stroke the main control circuit signals the controller to reduce pump output. This enables the pump to exert higher pressure while requiring less horsepower. Pressure required to compress the product will be releived above 6500 PSI through Main system relief valve No. 3. The main cylinder continues to extend until the control circuit signals the controller to stop output to the base end of the plunger cylinder.




9
10
11
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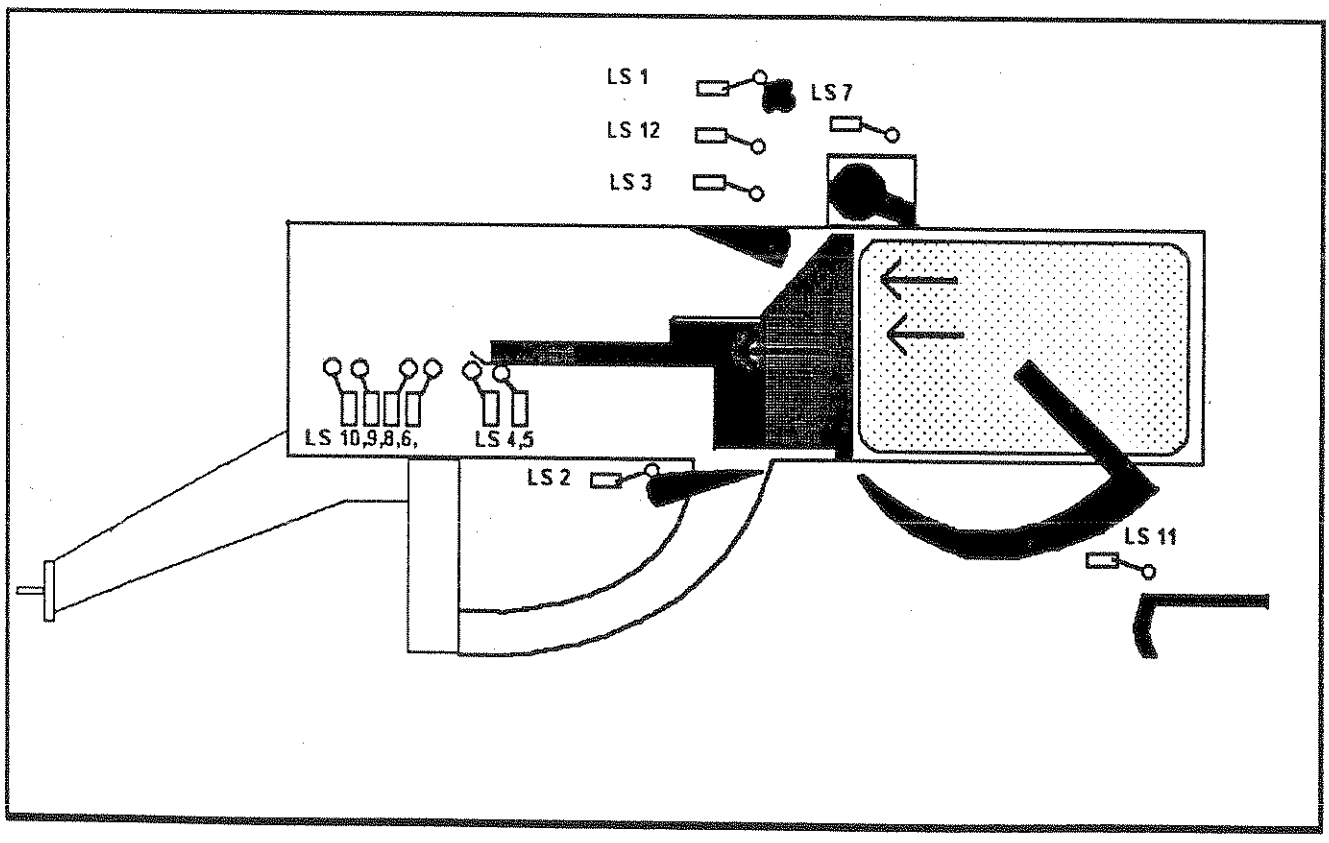
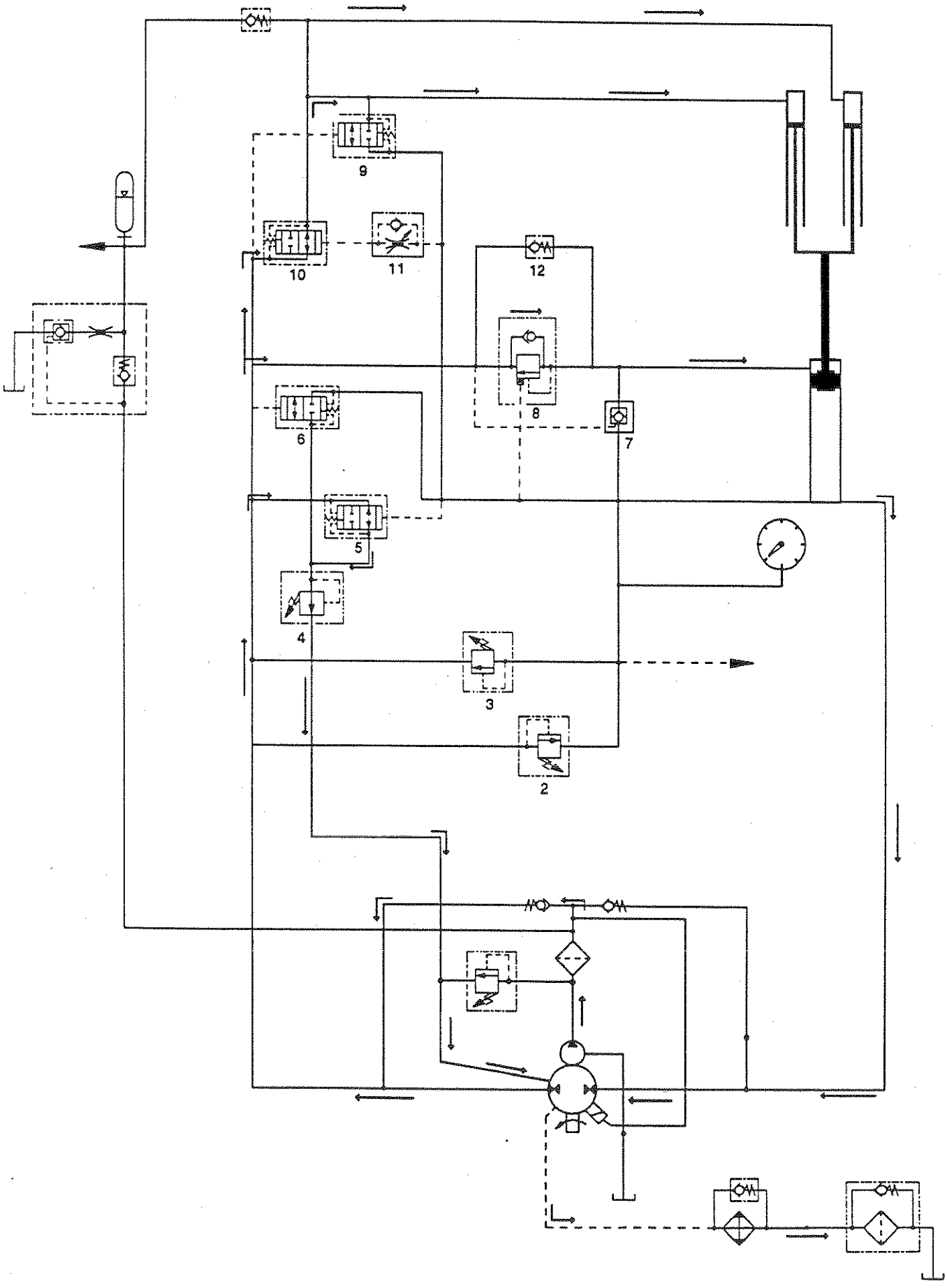
PLUNGER RETRACT PHASE 1

The main control circuit signals the controller to direct pump output to the rod end of the main cylinder. In the first phase of plunger retract the compressed product exerts force against the plunger. The force is great enough that for a moment pressure at the inlet side of the pump is greater than pressure at the outlet side. The result is the pump acts as a motor until the pressures equalize.

In the beginning stage of plunger retract, pressure on the base end is high. The Make up cylinder discharge valve No. 10 remains open as during plunger advance. Output from the pump fills the make up cylinders and the rod end of the main cylinder. Oil flow to the main cylinder passes through the check valve in the regenerative valve No. 8. Maximum pump output of 80 gallons per minute is divided, half going to the makeup cylinders and half going to the rod end of the main cylinder. Charge pump flow circulates through Charge Flow valve No. 5 and relief pressure is regulated by the remote relief No. 4.

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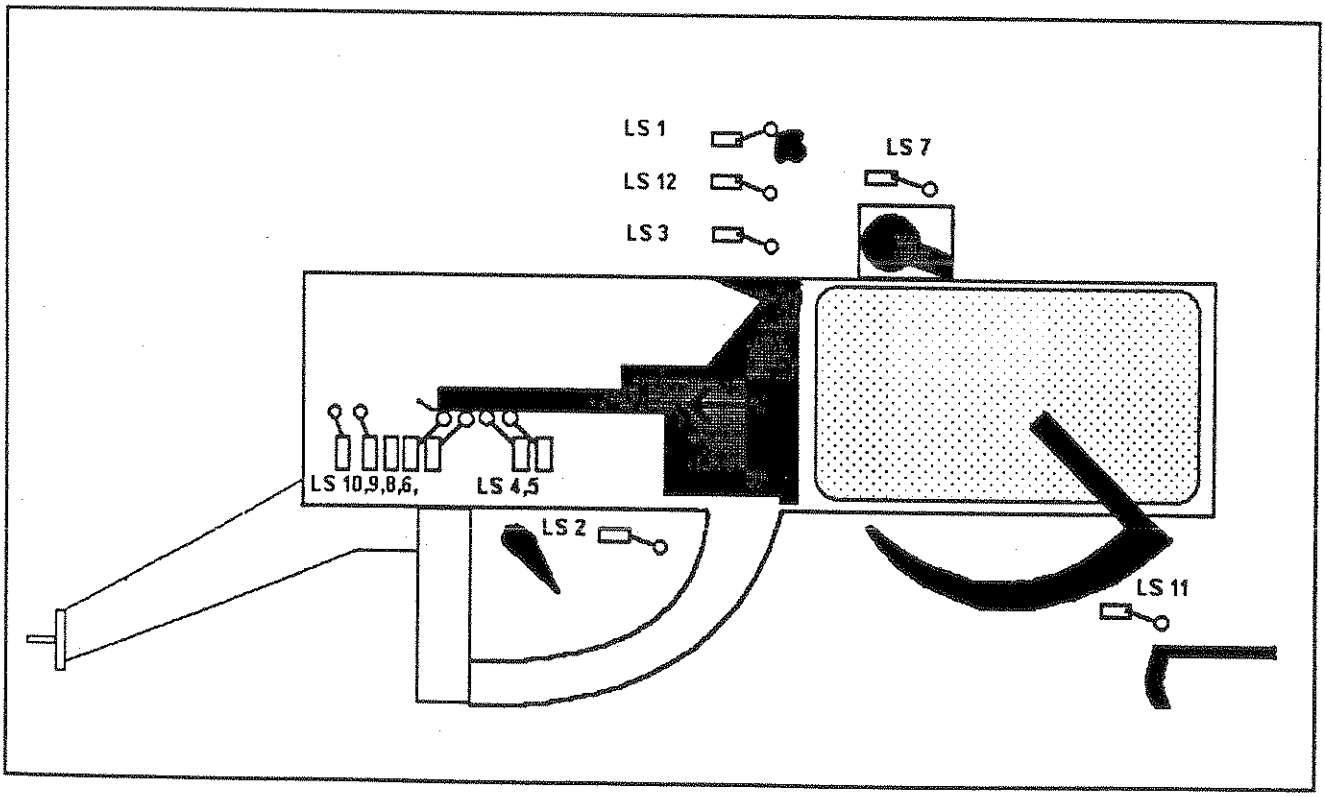
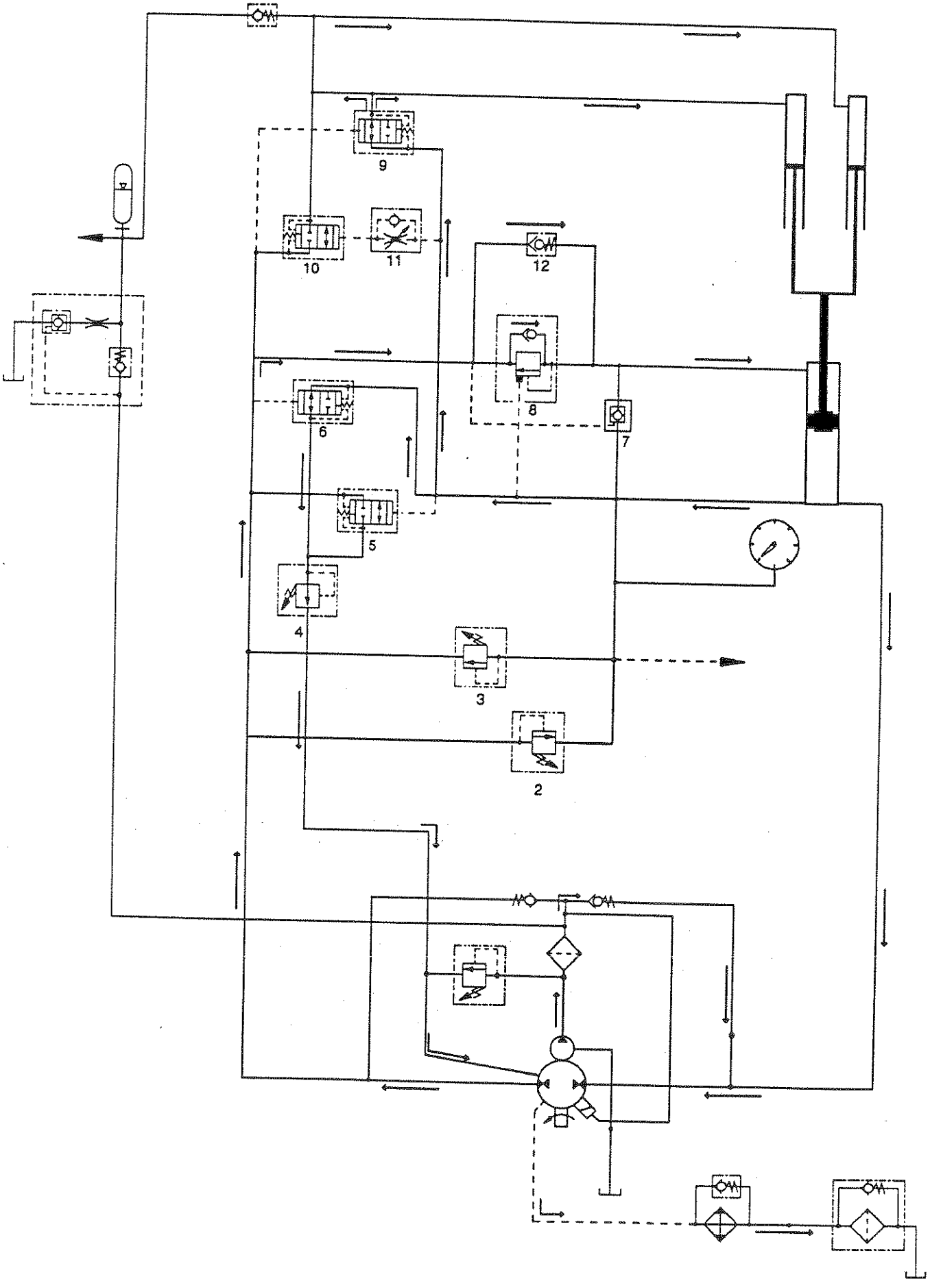
PLUNGER RETRACT PHASE 2

In phase 2 of plunger retract, pump output pressure becomes higher than pressure on the inlet side. Pump output flows to the rod end of the main cylinder through the check valve in the regenerative valve No. 8 and check valve No. 12. Low pressure on the base end of the main cylinder has allowed discharge valve No. 10 to close. At the same time, Make up cylinder fill valve No. 9 opens. This connects the base end of the plunger cylinder to the make up cylinders. Now full pump output of 80 gallons per minute is directed to the rod end of the main cylinder. Oil flow from the base end of the main cylinder is divided, half going to the inlet side of the pump and half going to the make up cylinders. Charge pump flow is directed from the base end of the main cylinder through the Remote charge flow valve No. 6. Pressure is regulated by the charge pump remote relief valve No. 4. At the end of the plunger stroke the main control circuit signals the pump controller and pump output is stopped.

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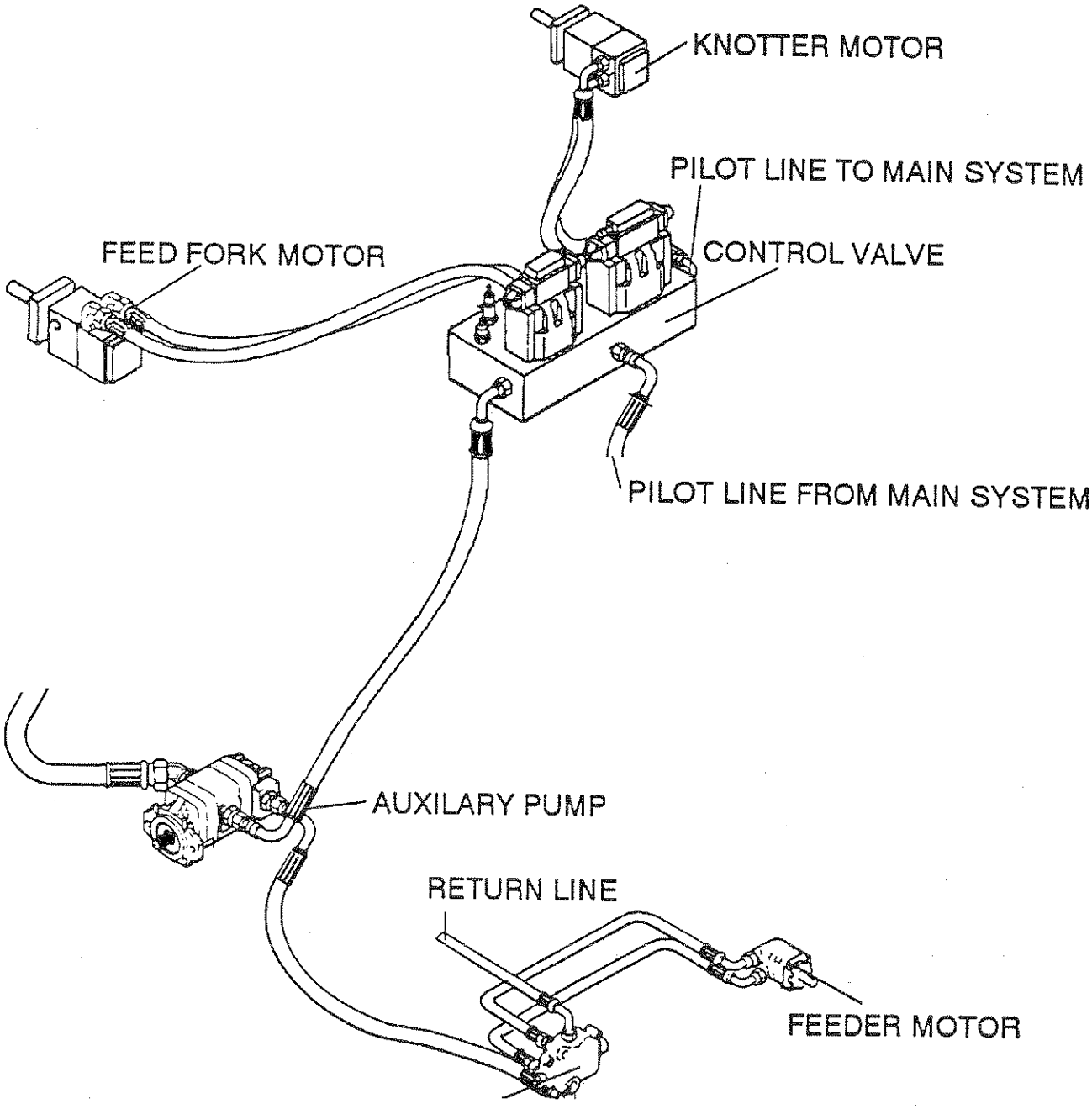
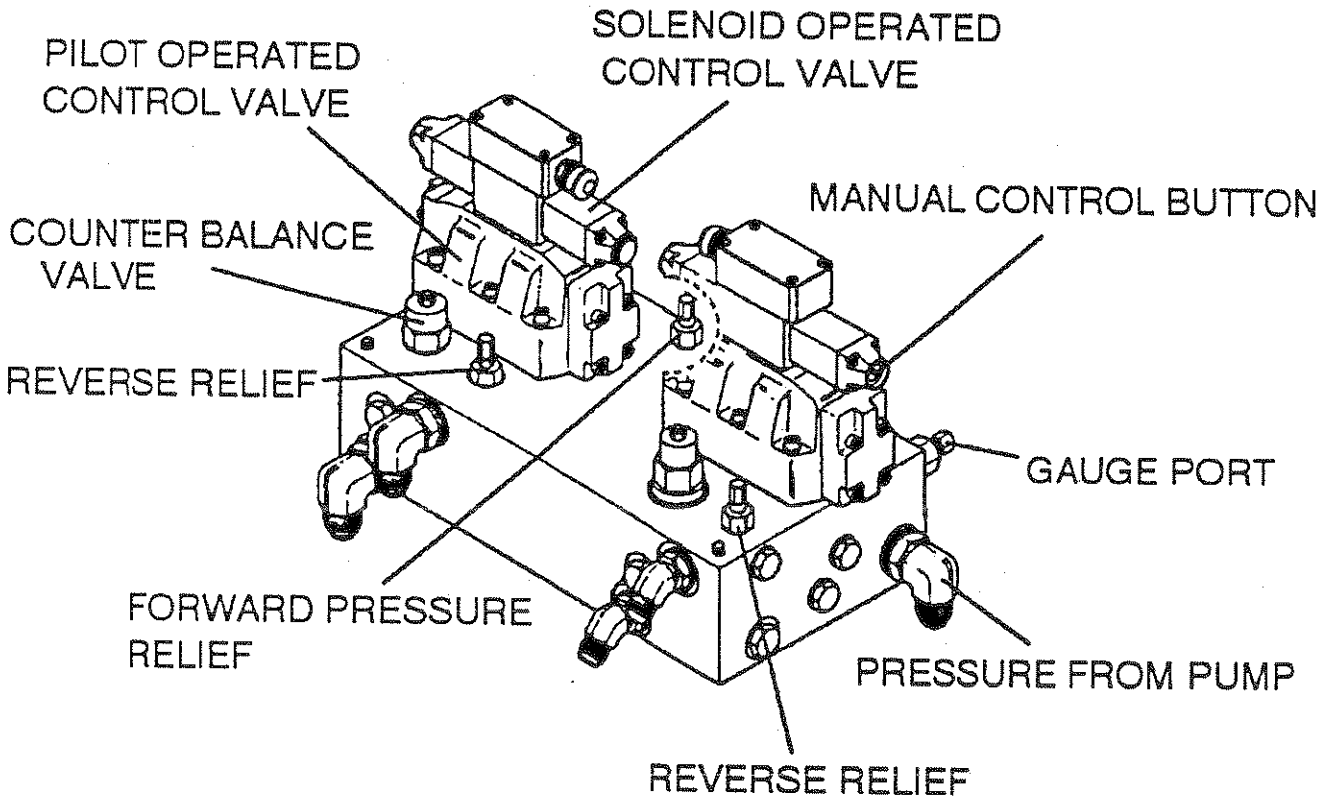
AUXILIARY SYSTEM

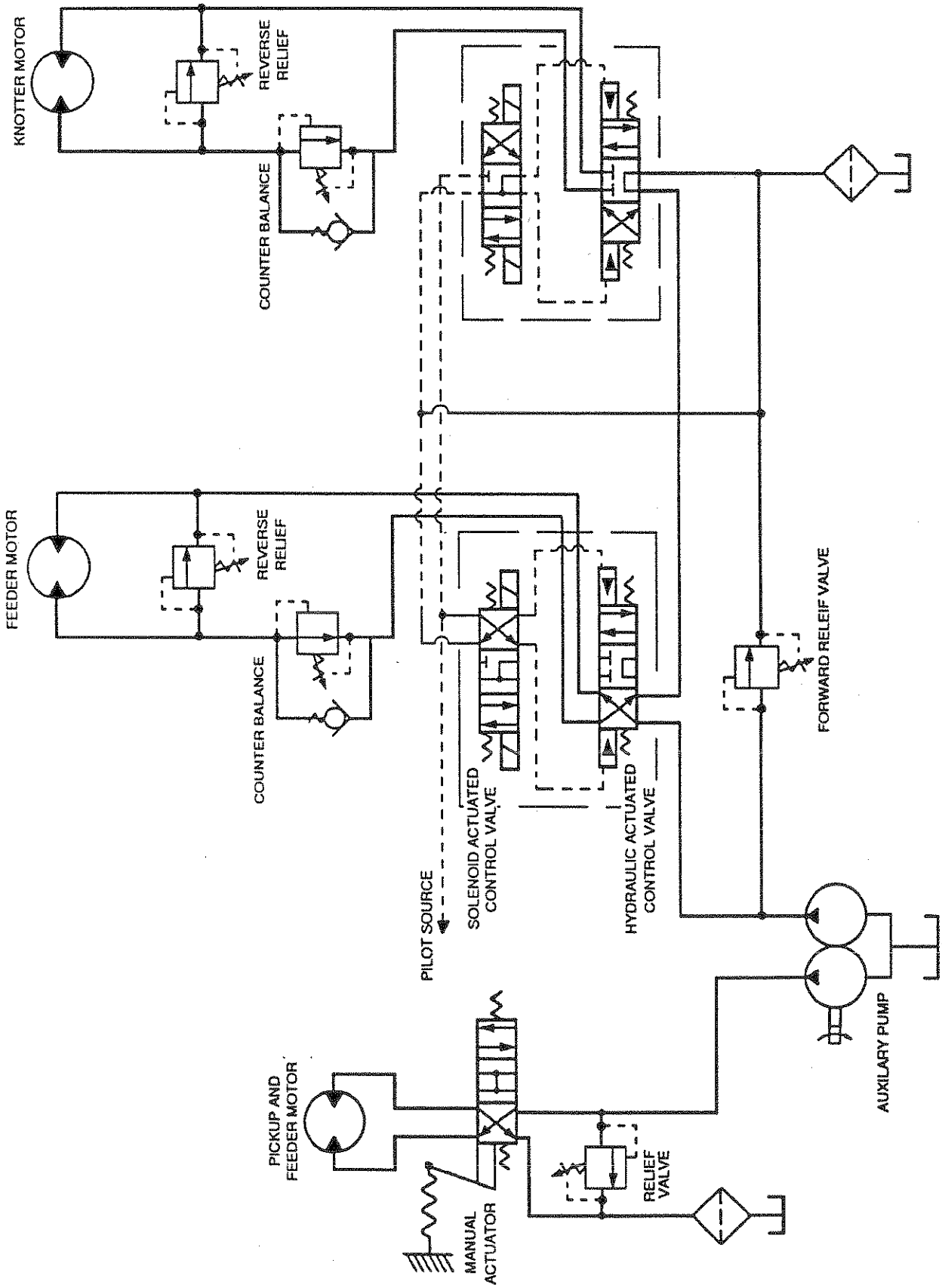
The Auxiliary system operates the feeder, feed fork and knotter. A single unit mounted to the main pump contains two pumps producing an output of 20 gallons per minute each. The front portion of the auxiliary pump provides output for the first feeder motor. The first feeder motor will operate the feeder at about 162 RPM. A manually operated directional control valve allows the operator to stop or reverse the first feeder. A relief valve for the first feeder is located in the directional control valve. Relief pressure is set at 3200 PSI.

The rear portion of the auxiliary pump provides output for the feed fork motor and the knotter motor. Pump output is routed to a valve manifold (see page 18). Solenoid actuated control valves direct pilot pressure to operate directional valves mounted to the manifold. These valves control the feed fork and knotter. Pilot pressure to activate them is supplied by the charge pump on the main system. The manifold also contains relief valves and counter balance valves. One relief valve set at 3500 PSI limits pressure for both the feed fork and the knotter. A separate relief valve for each component limits maximum pressure during manual operation in reverse. The counterbalance valves contribute to the smooth operation of the feed fork and knotter. The counterbalance prevents free fall of the feed fork as it travels over top dead center. It also lessens chatter each time the feed fork starts. The knotter drive benefits in the same manner. The feed fork motor should operate the feed fork at 56 RPM. The knotter motor should operate the knotter at 47 RPM.


KNOTTER MOTOR
PILOT LINE TO MAIN SYSTEM
FEED FORK MOTOR
CONTROL VALVE
PILOT LINE FROM MAIN SYSTEM
AUXILARY PUMP
RETURN LINE
FEEDER MOTOR

KNOTTER AND FEED FORK MANIFOLD



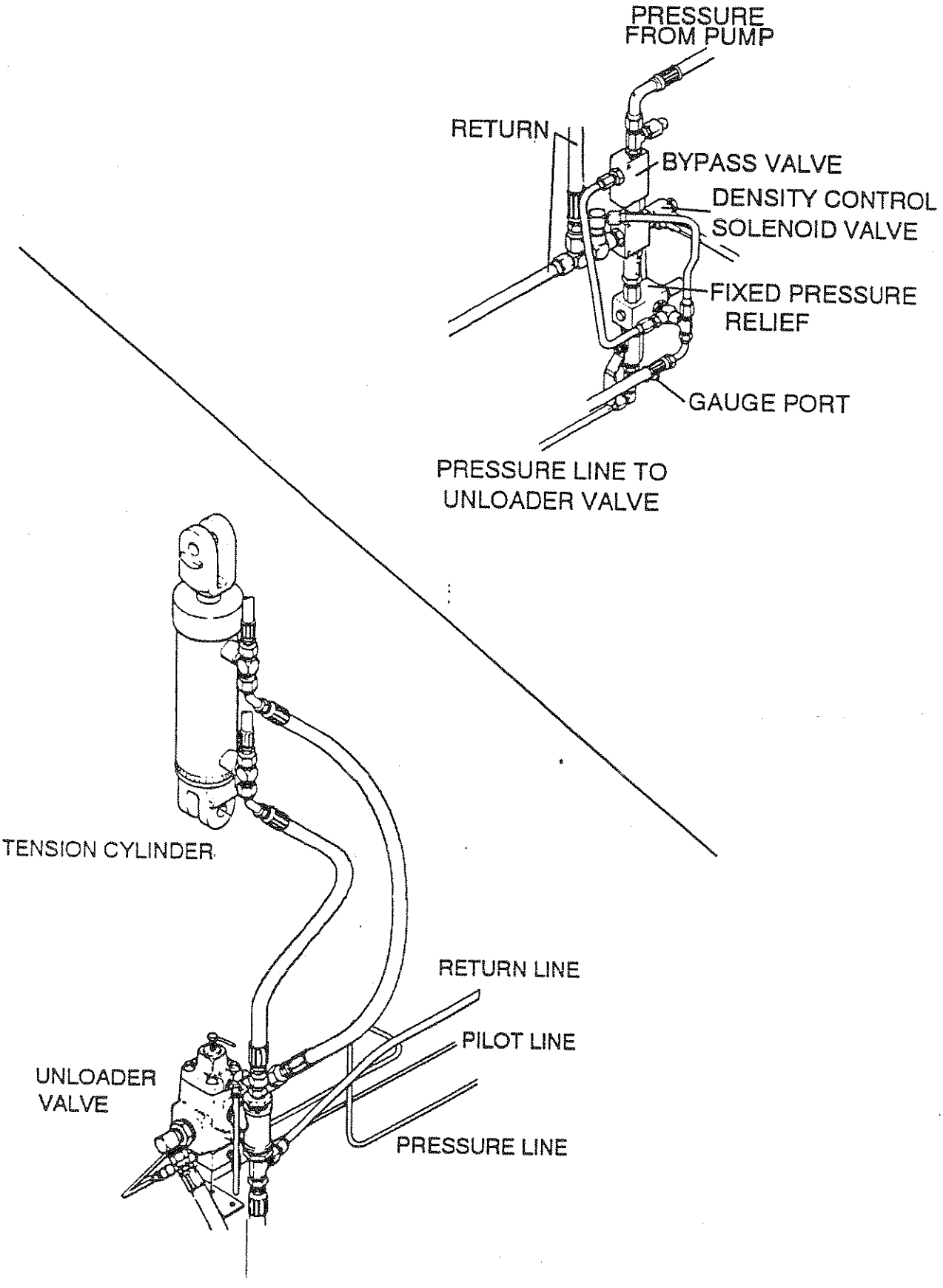

KNOTTER MOTOR
REVERSE RELIEF
COUNTER BALANCE
FEEDER MOTOR
REVERSE RELIEF
COUNTER BALANCE
PILOT SOURCE
SOLENOID ACTUATED CONTROL VALVE
HYDRAULIC ACTUATED CONTROL VALVE
FORWARD RELEIF VALVE
PICKUP AND FEEDER MOTOR
MANUAL ACTUATOR
RELIEF VALVE
AUXILARY PUMP

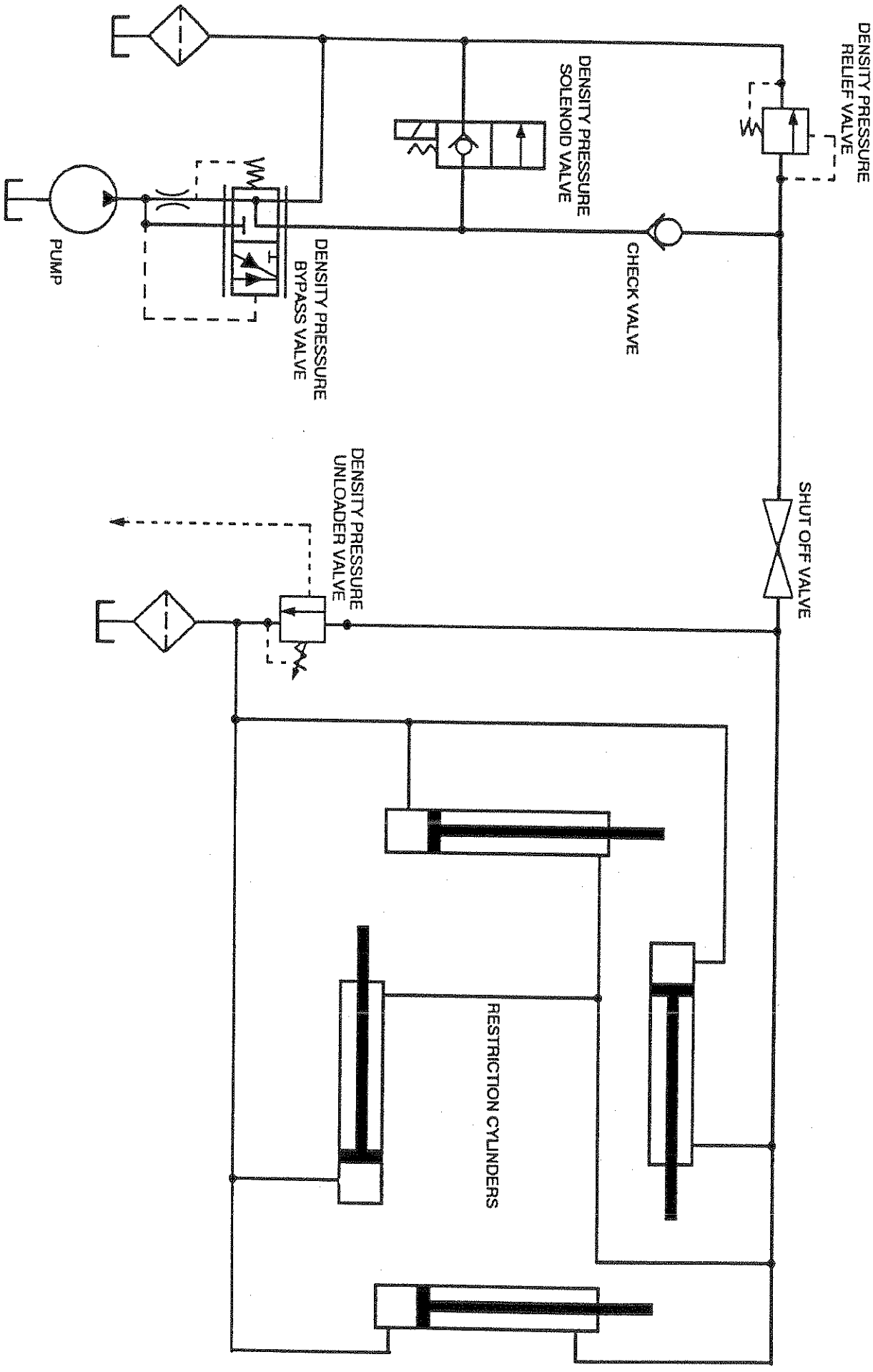
DENSITY SYSTEM

The Density control system applies pressure to the top and sides of the forming bale. Four hydraulic cylinders exert force on the top and side restriction rails. These hydraulic cylinders are pressurized by a 2 gallon per minute pump mounted on the main drive assembly at the front of the baler. This pump maintains pressure applied to the bale as it is being formed. An increase or decrease in bale density is accomplished by regulating this pressure during the advance of the plunger. The amount of restriction on the bale being formed affects the amount of plunger pressure required to compress and move the bale through the machine.

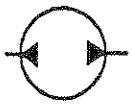
The maximum obtainable pressure generated by the plunger drive system is controlled by the density control system. An unloader valve is provided to control plunger pressure. Pilot pressure from the plunger drive system signals the unloader valve to regulate density system pressure applied to the restriction rails during plunger advance. When the plunger is not advancing density pump output is released back to the reservoir while a check valve maintains density pressure on the restriction rails at the pressure attained during the previous plunger advance. This pressure will be held until the plunger begins it's next advance at which time density pump pressure will again be applied to the restriction cylinders.

A bypass valve is installed in the density control circuit. This allows pump output at baler idle speeds to flow freely back to the reservoir. This is necessary to prevent damage caused by heat build up during periods of low output. The next valve in the circuit is the density control soleniod valve. This valve, when energized, allows pump output to return to the reservoir anytime except during plunger advance. During plunger advance a direct acting relief valve limits pressure to 2150 PSI. For ease of service a ball valve can be closed to prevent pressure from being applied to the restriction rails.


PRESSURE
FROM PUMP
RETURN
BYPASS VALVE
DENSITY CONTROL
SOLENOID VALVE
FIXED PRESSURE
RELIEF
GAUGE PORT
PRESSURE LINE TO
UNLOADER VALVE
TENSION CYLINDER
RETURN LINE
PILOT LINE
UNLOADER
VALVE
PRESSURE LINE

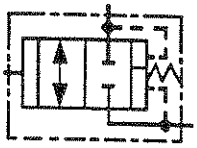

DENSITY PRESSURE RELIEF VALVE
DENSITY PRESSURE SOLENOID VALVE
CHECK VALVE
PUMP
DENSITY PRESSURE BYPASS VALVE
DENSITY PRESSURE UNLOADER VALVE
SHUT OFF VALVE
RESTRICTION CYLINDERS

SYMBOLS



PUMP

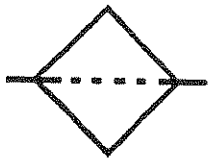
CHECK VALVE



LOGIC VALVE

MOTOR

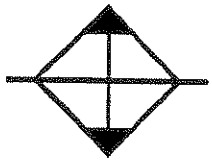
FIXED RESTRICTION



FILTER

MANUALLY OPERATED
CONTROL VALVE

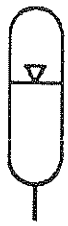
FLOW CONTROL



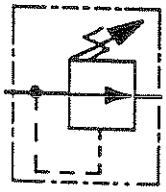
HEAT EXCHANGER

SOLENOID OPERATED
CONTROL VALVE

PILOT OPERATED
CONTROL VALVE



GAS CHARGED ACCUMULATOR



ADJUSTABLE RELIEF

SHUT OFF VALVE

CYLINDER

SAFETY

1. SHUT OFF TRACTOR, DISENGAGE P.T.O., AND LOCK TRACTOR TRANSMISSION AND/OR BRAKES BEFORE ADJUSTING, LUBRICATING, CLEANING OR SERVICING THE BALER
2. KEEP HANDS, FEET AND CLOTHING AWAY FROM POWER DRIVEN PARTS.
3. AVOID WEARING LOOSE CLOTHING WHICH CAN EASILY BE CAUGHT IN MOVING PARTS.
4. USE APPROPRIATE SIGNS OR WARNING LIGHTS WHEN OPERATING ON PUBLIC ROAD WAYS.
5. MAKE CERTAIN EVERYONE IS CLEAR OF AND OFF THE BALER BEFORE OPERATING ANY PART OF THE MACHINE.
6. ALWAYS USE LIGHTS FOR NIGHT WORK.
7. KEEP ALL SHIELDS IN PLACE AND IN SERVICEABLE CONDITION.
8. DO NOT GO NEAR ANY EQUIPMENT UNTIL ALL MOVING PARTS ARE STOPPED.
9. DO NOT GO UNDER ANY RAISED COMPONENTS UNTIL THEY ARE SAFELY BLOCKED OR CHAINED IN POSITION.
10. AT ALL TIMES CARRY A 2A -10B FIRE EXTINGUISHER ON THE MACHINE
11. AT ALL TIMES KEEP THE MANYAL CONTROL CABLE IN A SAFE LOCATION AWAY FROM POWER DRIVEN PARTS.
12. REMEMBER SAFETY IS ONLY A WORD UNTIL IT IS PUT INTO PRACTICE.

Contents

FREEMAN 1592 BIG BALER TROUBLESHOOTING GUIDE INTRODUCTION

The following information has been assembled to provide the 1592 operator or service person some guidelines to follow in solving any problems which might occur while operating the baler.

The Freeman 1592 Big Baler is a high density mechanical baler operated by an electrically controlled hydraulic system. To efficiently troubleshoot problems that occur with the baler it is important to gather information that will narrow the possibilities of the cause of a malfunction. Three categories should be considered when problems are encountered.

1. Is the problem mechanical?
2. Is the problem electrical?
3. Is the problem hydraulic?

The process of gathering information regarding a malfunction may require more than one person. An observer may be necessary in determining how the functions of the baler are occurring. It is very important to have accurate information about the baler operation to assist in the problem solving process. For any problem first determine exactly what functions of the baler, if any are operating correctly. Carefully study the information on the following pages. The major components of the baler, how and when they can operate are described in the text to follow. When attempting to solve a problem with a baler the service person can use the baler itself as it's own testing instrument. To do this however requires a thorough knowledge of the balers functions.

TROUBLESHOOTING TOOLS

Active troubleshooting of baler components requires the use of the tools and resources listed below.

1. Operators manual, Parts manual, Electric and Hydraulic Information and Troubleshooting Guide.
2. Wiring diagrams and Electrical schematics for the Freeman 1592 Big Baler.
3. Hydraulic schematics.
4. 12 volt test light.
5. Hand held volt / ohm meter.
6. Hydraulic pressure test gauges.
7. Lightweight string.
8. Replacement electrical components (fuses, limit switches, relays).

USING SCHEMATICS AND DIAGRAMS

Included with every 1592 baler is a complete set of detailed hydraulic schematics, electrical schematics and wiring diagrams. These diagrams are also available upon request from J.A. Freeman & Son. The hydraulic schematics show the paths that fluid flows to operate individual hydraulic components. Hydraulic components that direct or regulate fluid flow are also shown. Main system hydraulic pressure test ports are identified on the hydraulic schematic. Other hydraulic pressure test ports are described and shown in the operators manual and in Electrical and Hydraulic Information Guide.
The full size wiring diagram identifies components and their locations, wire routing and proper connec-

tions. The electric schematic shows the path of electrical current to the various electrical components. To assist in the process of troubleshooting, test points are identified on the electrical schematic. These are points in the control box or at junction blocks where voltage or continuity can be checked. On the electrical schematic they appear as a heavy dot accompanied by two letters and two numbers. An example being TB 2-4 which stands for terminal block 2 post number 4 (see page 12) Check the wiring diagram for the actual location of TB 2-4 on the machine.
Included in this information guide are individual electrical schematics that illustrate the flow of electrical current for each step of baler operation. Use these illustrations in combination with the full size electrical schematic to help quickly identify which circuits are active at any time.

MAJOR SYSTEMS AND THEIR FUNCTIONS

A great deal of time can be saved in the process of troubleshooting if the service person understands the major systems of the baler and how they contribute to the total operation. Through a process of elimination the systems that function correctly or incorrectly can be identified.The following information describes major systems and the activety which can occur within each of these systems.

Operation of Mechanical Components

Power from the tractor PTO shaft is transmitted through the PTO slip clutch to the mechanical drive unit to operate the main hydraulic pump and the auxiliary pump. The mechanical drive unit also includes an alternator to maintain electrical system voltage and a small hydraulic pump to provide pressure for the density control system. The auxiliary system includes two separate pumps. The rear section of the pump body provides hydraulic fluid to operate the feeder crank and pickup.

Any time the PTO shaft is turning at a sufficient RPM the feeder crank and pickup can operate. The feeder crank is unaffected by electrical power from the control circuit. The alternator will rotate but will not charge unless the main power switch is turned on. The density system pump will operate and if PTO R.P.M. is sufficient, will pressurize the hydraulic cylinders which control the restriction rails.

NOTE: At low RPM the density pump output is not applied to the cylinders. The system includes a bypass valve which prevents overheating of the pump at low RPM.

THE FOLLOWING CONDITIONS CAN OCCUR WITH THE TRACTOR PTO ENGAGED AND OPERATING AT APPROXIMATELY 500 RPM.

1. Components of the main drive unit will rotate.
2. The feeder crank will operate.
3. Density pressure will be applied to the restriction rails.

Operation of Electrical Power Supply System

Electrical power for the baler control circuit is provided by a 12 volt battery. With the exception of the feeder all of the functions of the baler require electrical power so they may operate. Electrical power from the 12 volt battery is provided directly to the work lights. A manual switch allows the operator to turn the work lights on or off. Electric power is provided to the control circuit by the power switch on the control panel. Moving the power switch to the on position allows power to reach the control circuit if the following conditions exist.

1. There must be sufficient volume of oil in the reservoir
2. The oil temperature must be below 220 f.

Power from the battery passes through the power switch and illuminates the power "ON" light. It then passes through a 10 amp fuse which protects the circuit from damage should an overload occur. Current travels on through a 220 f. thermostat, an oil level switch, through relay 5 and to ground. This flow of current sets relay 5 and provides power to the baler control circuit. If relay 5 does not set, the red high temp / low oil warning light illuminates and power is not available to the control circuit. Refer to the diagram on page 14.

THE FOLLOWING CONDITIONS CAN OCCUR IF 12 VOLT POWER IS AVAILABLE.

1. The work lights will operate.

2. The power on light will illuminate when the power switch is moved to the on position.

3. With the power switch in the on position the voltmeter will register system voltage, and the oil tem perature guage will register. The alternator indicator light will illuminate if the alternator is not charging. When the tractor PTO is engaged the alternator will operate and the alternator indicator light will no longer illuminate. NOTE: PTO speed may have to be increased to full operating speed (1000 RPM) in order to start the alternator charging depending on battery condition. If a low oil level condition exists the amber warning light will illuminate. If a high temperature condition exists the red warning light will illuminate.

4. With the power switch in the on position and a satisfactory oil supply the "AUTO" mode light can illuminate if the auto / manual switch is in the auto position.

5. With the tractor PTO engaged and the power switch in the "ON" position hydraulic pressure is not applied to the restriction rails.

Operation of Control Circuit in "MANUAL" mode, Tractor PTO operating.

Power is available to the control circuit through the power supply circuit. By plugging in the manual control pendant to one of the six phone jacks on the control panel power can be applied to operate the plunger, the feed fork or the knotter.

1. The flow of power to operate the plunger is limited only by LS 1, the plunger stop, plunger safety knotter switch. This prevents the plunger from being advanced if the knotter is out of the home position. The plunger can be retracted unaffected by the limit switches and relays in the control circuit. See page 50.

2. The feed fork can be operated in forward or reverse and is not affected by any switches or relays in the control circuit.

3. The knotter can be operated in forward or reverse except where the reverse safety switch (LS 7) prevents reverse operation of the knotter through a critical point of the cycle.

Operation of Control circuit in "AUTO" mode, Tractor PTO operating.

Power is available to the control circuit through the power supply circuit. With the Man / Auto switch in the "AUTO" position the "AUTO" indicator light illuminates and power is available to the control circuit and it's system of switches and relays. In the "AUTO" mode the baler can perform the necessary functions to bale a product according to it's design.

TROUBLESHOOTING / VISUAL INSPECTION OF COMPONENTS

MECHANICAL COMPONENTS

For any malfunction check mechanical components first. If necessary make adjustments to assure that mechanical components are in good operating condition. Check the following mechanical components and their condition. Listed with each component is a possible problem or number of problems that could occur due to the failure of that component.

CAUTION: Stay clear of the baler when operating. Disengage tractor P.T.O. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler to cease before inspecting, adjusting or servicing baler.

Feed Sensor

The feed sensor is manually activated by the charge of material pushed into the bale chamber by the feed fork. When the feed sensor is raised a sufficient amount the plunger is activated. The feed sensor is spring loaded and will return to it's rest position as the plunger compresses the charge of material. Foreign material can cause the feed sensor to stick and become inoperative. If the feed sensor does not raise the plunger will not be activated. If the feed sensor does not return the plunger will stall at the end of it's stroke and will not return until the feed sensor is returned to the rest position.

Limit Switch Arms

The position of most of the balers mechanical components is communicated to the control circuit through several limit switches. The limit switches are mechanically operated. Check all the limit switch lever arms and the cam or component that operates the lever arm. Foreign material can cause a limit switch arm to stick and cause a malfunction. Breakage of a lever arm may also cause a malfunction. Loose lever arm clamping screws may cause a malfunction even though the lever arm and switch appears intact.

Knotter Brake

The knotter brake helps to hold the needle yoke in it's rest position. Should the brake fail to hold the needle yoke in position the plunger may not operate. Limit switch # 1 is operated by the needle yoke in the home position and prevents damage to the needles.

Feeder drive chain

A drive chain connects the feeder motor to the feeder crank. A failure of this chain will prevent the operation of the feeder crank and the pickup.

Pickup drive chain

A drive chain connects the feeder crank to the pickup drive clutch assembly. Any time the feeder operates the pickup can operate provided the drive chain is intact

Hydraulic Oil

Check hydraulic oil level. A sight gauge is installed on the front of the hydraulic reservoir. A manual temperature gauge is included with the sight gauge. Check the gauge reading and compare it with the reading on the oil temperature gauge located on the dash panel. Low oil level or high oil temperature will prevent power from reaching the control circuit.

Hydraulic hoses

Check all hydraulic hoses and lines for leaks.

⚠ CAUTION: Always use a piece of cardboard or wood to search for suspected pressurized hydraulic leaks. NEVER use hands; escaping fluid under pressure can penetrate skin.

Hydraulic cylinders

Check main cylinder for leaks. Check restriction rail cylinders for leakage.

TROUBLE SHOOTING CHECKLIST

Tractor PTO engaged, main drive unit operating.

Confirm that the main drive unit is operating. Check for slipping clutches or belts by rapidly increasing tractor PTO R.P.M. from an idle. Listen carefully to the sound of the baler as the speed of the drive unit increases. If clutches or belts are slipping there may be a noticeable difference in the rate at which tractor engine speed increases compared to the rate at which baler speed increases. If slipping clutches or belts are suspected adjust according to the instructions in the operators manual.

⚠ CAUTION: Stay clear of the baler when operating. Keep all others away while the baler is operating.

Feeder Crank operation, Pickup operation.

Confirm proper operation of the feeder crank and pickup. Any time the Tractor PTO is engaged and the main drive unit is operating the feeder crank and pickup should operate. Check the operation of the Stop / Reverse control valve. Pull on the stop / reverse control rope to reverse the direction of the feeder. The pickup should not operate in reverse due to the overrunning clutch on the pickup drive. Release the rope to allow the feeder and pickup to operate normally.

⚠ CAUTION: Stay clear of the baler when operating. Keep all others away while the baler is operating.

If the feeder or pickup does not operate check:

Feeder drive chain, Hydraulic oil level, Hydraulic lines, Auxilary pump output, Mechanical drive unit operation, Main pump coupler.

Main Power Switch / On

Make sure the main power switch is in the on position. The power indicator light should illuminate when the switch is in the on position. The oil cooler fan will operate and cycle as designed.

⚠ CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating. Disengage tractor P.T.O. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler to cease before inspecting, adjusting or servicing baler.

If the power light does not illuminate and the fan does not operate check the following items.

Check for battery voltage. The work lights are connected directly to the battery. If the work lights operate battery voltage should be available to the power supply circuit. Confirm battery voltage with a hand held voltmeter.

With the power switch in the "on" position listen for operation of the cooling fan. Also check the voltage reading on the gauge on the dash panel. If the cooling fan operates and voltage registers on the gauge but the light does not light the bulb may be defective.

Check battery cable connections.
Open the control box and check for battery voltage at the main switch and at the power indicator lamp. Refer to the control circuit wiring diagram for information. Correct any loose connections or other problems to restore power to the power supply circuit.
If the power indicator lamp illuminates but the cooling fan and gauges do not operate check the fuse. Replace the fuse if defective. Use only a 10 amp. fuse.

Manual / Auto Switch in the "Auto" position

Power is made available to the control circuit through the power supply circuit. With the Man. / Auto switch in the "AUTO" position, the "AUTO" indicator light illuminates and power is available to the control circuit and it's system of switches and relays. In the "AUTO" mode with the PTO engaged, the feed fork should operate.

⚠ CAUTION: Stay clear of the baler when operating. Keep all others away while the baler is operating.

If the "AUTO" indicator light does not illuminate and the feed fork does not operate check the dash panel for indications of low or hot oil. If the red warning light is lit due to a low oil or hot oil condition power will be disconnected from the control circuit.

Switch the mode selector to "MANUAL". Plug in the manual control pendant to the plunger or feeder sockets. With the tractor PTO engaged operate the control pendant. If 12 volt power is available to the control circuit the selected component should operate in the manual mode.

Shut off tractor engine and disengage P.T.O., Check for voltage in the control box at TB 4-2 If no voltage registers at this point check the power supply circuit. If voltage is available at TB 4-2 check for a defective mode selector switch or bad electrical connections.

Power Supply circuit checks:

⚠ CAUTION: Disengage tractor P.T.O. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler to cease before inspecting, adjusting or servicing baler.

If it is determined that low oil level or hot oil is not a factor check the thermostatic switch and the oil level switch for proper operation. With the power switch in the on position check for voltage at JB 4-1 (located inside the right hand side of the dash panel support frame). If voltage is present at JB 4-1 then power is available to the thermostatic switch.

Check for voltage at JB 4-6. If voltage is present at JB 4-6 power is available through the thermostatic switch and the oil level switch.

Check for voltage at JB 4-2. If voltage is present at JB 4-6 but not at JB 4-2 then relay 5 may be defective.

Needle Yoke / Home position

The needle yoke must be in the home position before the plunger can advance. A cam on the needle yoke drive shaft operates LS 1 to allow 12 volt power to be available to LS 2 and LS 3.

Check the position of the needle yoke and confirm that LS 1 is operated. Adjust LS 1 according to the instructions listed in the operators manual.

With the tractor PTO disengaged, the power switch "ON" and the mode selector in the "AUTO" position, Check for voltage at JB 2-8. JB 2-8 is located forward of the needle yoke drive shaft on the left hand side of the machine. A 12 volt reading at JB 2-8 confirms that power is available through LS 1.

Check for voltage in the control box at TB 2-5. If power is not available at JB 2-8 or at TB 2-5 check voltage at JB 2-1. A 12 volt reading at JB 2-1 confirms that power is available to LS 1. If power is available at JB 2-1 and not at JB 2-8, LS 1 may be mis-adjusted or faulty.

Feed Sensor / Feed Fork Operation

The feed sensor is manually activated by a charge of material pushed into the bale chamber by the feed fork. When the feed sensor is raised a sufficient amount, LS 3 is operated and when the feed fork reaches top dead center to operate LS 2 the plunger is activated. The feed sensor is spring loaded and will return to it's rest position as the plunger advances to compress the charge of material.

Feed Fork

Confirm the correct operation of the feed fork. The feed fork should operate anytime the tractor PTO is operating, power switch is on and the mode selector is in the "AUTO" position. If the plunger is advancing the feed fork will not operate.

⚠ CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

If the feed fork does not operate correctly in "AUTO" mode, switch to the manual mode and use the manual control pendant to operate the feed fork. Operating the feed fork in the manual mode provides power directly to the feed fork solenoid valve with out any affect from components of the control circuit.

If the feed fork still does not operate using the manual control check electrical connections to the feed fork solenoid valve.

⚠ CAUTION: Disengage tractor P.T.O. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler to cease before inspecting, adjusting or servicing baler.

Check for hydraulic power. Operate the tractor P.T.O. at 250 rpm. If hydraulic pressure is available the feed fork can be manually activated by depressing the manual control pin on the end of the feed fork solenoid valve. This will help to confirm if failure of the feed fork is due to an electrical or hydraulic problem.

⚠ CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating. Disingage tractor P.T.O. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler to cease before inspecting, adjusting or servicing baler.

To check the power supply to the feed fork in the "AUTO" mode disengage the tractor P.T.O. and shut off tractor engine. Turn the power switch on. Select the "AUTO" mode. Check for 12 volts at TB 2-2. Voltage at this point confirms that power is available from the contacts of Relay 1.

Check for 12 volts at TB 2-3. Voltage at this point confirms that power is available through LS 8. If power is not available at TB 2-3 check LS 8 and related wiring.

Feed Sensor

Check the operation of the feed sensor. With the main power switch in the "OFF" position manually lift the feed sensor and listen for the audible "click" of LS 3 being operated. Observe the operation of the activating cam and the lever arm. Correct adjustment of the feed sensor is described in the operators manual.

Check the feed sensor for freedom of operation throughout the entire range of it's travel. Foreign material can cause the feed sensor to stick and become inoperative. If the feed sensor does not raise, the plunger will not be activated. If the feed sensor does not return, the plunger will stall at the end of it's stroke and will not return until the feed sensor is returned to the rest position.

Check the operation of LS 2. LS 2 must operate correctly for power to reach LS 3. With the tractor PTO disengaged, power "ON" and mode selector in "AUTO" position, operate LS 2 manually and use string to hold the lever arm in the operated position. Check for voltage at JB 2-10. If voltage is not available LS 2 or related wiring may be defective.

Check the operation of LS 3. With the tractor PTO disengaged and the power switch in the "OFF" position connect the leads of an ohm meter to JB 2-5 and JB 2-10. Raise the feed sensor manually or operate the limit switch lever arm. When LS 3 is operated there should be continuity between JB 2-5 and JB 2 -10. If no continuity exists LS 3 may be defective.

Check for 12 volts. Use string to tie the lever arm of LS 2 in the operated position. Confirm that the needle yoke is in the home position and LS-1 is operated. Turn the power switch on and select the "AUTO" mode. Manually operate the feed sensor or LS 3 and check for voltage in the control box at TB 2-4. If LS 1, 2, and 3 are operated 12 volt power should be available at TB 2-4.

Plunger Advance

With the baler operating in the "AUTO" mode, if the feed sensor has operated LS 3 and the feed fork has operated LS 2, 12 volt power is available to set relay 1. When relay 1 is set the plunger can advance. If the plunger fails to advance make the following checks.

Confirm that all the components previously discussed are operating correctly.

With the tractor PTO disengaged, power switch on and mode selector in the "AUTO" position, use string to hold LS 2 and LS 3 in the operated position. Check for 12 volts at TB 2-8. Voltage at this point confirms that power is available through LS 1, LS 2 and LS 3 to set Relay 1.

Check that Relay 1 is set. Use an ohm meter to check for continuity between TB 3-10 and TB 4-6. Continuity between these two points confirms that relay 1 is set. If there is no continuity replace the relay or correct faulty electrical connections.

Check for continuity between TB 3-9 and TB 3-10. If no continuity exists check LS 4 and related wiring.

Check plunger operation in the "MANUAL" mode. If the plunger will advance and retract in the manual mode it confirms that the pump controller is receiving power. If the plunger will not advance there may be a problem with the main pump controller. Make sure the needle yoke is in the home position to operate LS 1. Refer to the Needle Yoke / Home position section for information on LS 1.
At this point in troubleshooting it may be useful to check the main pump for output by operating the controller manually.

⚠ CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

⚠ CAUTION: Before proceeding with any check of the controller and pump output, confirm the position of the needle yoke. It must be in the rest position with the needles out of the chamber. If these precautions are not taken severe equipment damage will occur.

Locate the manual control knob on the main pump. It is located on the lower right hand side of the pump. With the tractor PTO engaged, operate the manual controller on the pump. Turn the knob in one direction to advance the plunger and in the opposite direction to retract the plunger. If the plunger will not operate with the manual control there may be serious hydraulic system failure. If the plunger will operate with the manual control the problem may be electrical in nature.

Plunger Retract

When the plunger advances in the auto mode it is because relay 1 is set and current is directed through the pump controller to ground in the direction necessary to cause the plunger to advance. As the plunger reaches the end of its stroke LS 5 is released. This provides 12 volts to release relay 1. When relay 1 is released the flow of current through the pump controller is reversed and the plunger will retract.
If the plunger fails to retract take note of some of the following conditions.

⚠ CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

Note the position of the plunger. Is it fully extended or partially retracted.

Check Main System pressure. With the tractor PTO operating, power switch "ON" and mode selector in "AUTO" note the pressure reading on the gauge. If the plunger is stalled (indicated by an extreme horsepower draw) and the pressure reading is high it is most probable that for some reason relay 1 has not been released.

⚠ CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating. Disengage tractor P.T.O. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler to cease before inspecting, adjusting or servicing baler.

Check the feed sensor to see if it has returned to the rest position. Refer to the Feed Sensor / Feed Fork section.

Check the operation of relay 1 and it's electrical connections. With the tractor PTO disengaged, power switch on and mode selector in the "AUTO" position check for voltage at TB 2-4. A 12 volt reading at this point would indicate that power is available to release relay 1. If power is not available at TB 2-4 check for voltage at TB 1-9. A 12 volt reading at this point would indicate that power is available to LS 5. Check LS 5 for proper operation.

If the plunger is not stalled and main system pressure is zero the problem may be found in the electrical circuit that operates the controller.

Check operation of the plunger in the manual mode using the manual control pendant. If the plunger will operate it confirms that power is reaching the controller and the controller is functional.
Check LS 10 and it's related wiring. With an ohm meter check for continuity between TB 4-6 and TB 3-5. Continuity between these two points confirms circuit integrity between relay 1 and relay 4.

If the plunger is partially retracted (approx. 9" from the fully extended position) a problem may exist with relay 2 and LS 6. During a tie cycle the plunger cannot return past LS 6 unless relay 2 has been released.

⚠ CAUTION: Disengage tractor P.T.O. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler to cease before inspecting, adjusting or servicing baler.

Check for 12 volts at TB 2-9. A voltage reading at this point indicates that power is available to release relay 2. If no power is available check the operation of LS 12 and it's related wiring. Relay 2 may be defective or have a bad electrical connection. Check that LS 6 is operating correctly.

Knotter Operation

At some point during plunger advance the rotating meter wheel raises the meter bar enough to operate LS 11. LS 11 closes a portion of the circuit that activates the knotter. The operation of the knotter can occur only when the plunger reaches the fully extended position. When the plunger reaches the fully extended position LS 5 is released providing voltage to release relay 1 just as on a normal plunger stroke. Because LS 11 is operated, power from relay 1 is applied to set relay 3. With relay 3 set the knotter is activated.

If the knotter will not operate check the following possibilities.

⚠ CAUTION: Disengage tractor P.T.O. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler to cease before inspecting, adjusting or servicing baler.

HYDRAULIC OIL COOLING SYSTEM

Components to inspect if baler overheats.

CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating. Disengage tractor P.T.O. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler to cease before inspecting, adjusting or servicing baler.

Check heat exchanger. Remove any dirt or obstructions which would restrict cooling air flow.

Check cooling fan operation. Ensure fan is operating in the correct direction and in proper sequence. See page 13.

Check main system charge pressure. Check charge pressure while plunger is in stroke (advancing or retracting). Charge pressure should be approximatly 50 psi lower while pump is in stroke.
This pressure difference gives flushing and cooling of oil in the plunger drive circuit. Adjust the remote charge relief valve if necessary to obtain this pressure differential.

Inspect the following main valve cartridges and cartridge seals. See page 58, 59.

Cartridge no. 2, main system retract relief valve.
Cartridge no. 3, main system advance relief valve.
Cartridge no. 6, remote charge flow valve.
Cartridge no. 7, piloted closed check valve.
Cartridge no. 9 make up cylinder fill valve.

Check Feed Fork Counterbalance Valve adjustment
If the feed fork counterbalance is set too high it can contribute to overheating. See page 68-70.

To check or adjust the counterbalance setting baler hydraulic oil temperature must be at least 170 f. Install a 3500 psi gauge on gauge port A on the feed fork / knotter manifold. Operate the baler in the auto mode at 700 PTO R.P.M. Note the reading on the gauge as the feed fork operates. The gauge should fluctuate from about 600 psi as the feed fork comes up, to about 400 psi as the feed fork goes down.

⚠ CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

Adjust the counterbalance valve only high enough to:

1. Prevent free-falling of the feed fork.

2. Reduce "chattering" of feed fork. As the feed fork starts when cycling the plunger it is acceptable for chatter to occur for about 1/2 revolution.

The feed fork counterbalance valve is located on the left front, top corner of the Knotter and Feed Fork

manifold. To increase the counterbalance setting turn the adjusting screw counterclockwise. To decrease the setting turn the adjusting screw clockwise.

Check the main cylinder piston seal for leakage.

⚠ CAUTION : Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

To check main cylinder leakage operate the baler in manual mode and fully extend the plunger. Shut off tractor and disengage tractor PTO. Disconnect the hydraulic line from the rod end of the plunger where it connects to the main valve assembly. Cap the open port on the main valve. Position the open hydraulic line from the plunger so any oil leakage can be contained in a bucket. Operate the baler in the manual mode at low PTO R.P.M. Using the manual control pendant breifly operate the plunger in the advance mode. Observe any oil flow from the rod end hydraulic line. Without operating the plunger observe any oil flow from the rod end line. Oil flow in excess of approximately 1/2 cup per minute may be considered excessive.

Confirm that the plunger is fully extended, LS 5 is released and LS 11 is operated by the meter bar. If the plunger is stopped in the fully extended position follow troubleshooting steps in the Plunger Return section. If the plunger returns and the knotter fails to operate make the following checks.

Check for operation of the knotter in the manual mode. If the knotter operates using the manual control pendant it confirms that the solenoid valve and related wiring is OK. If the knotter will not operate in the manual mode check if hydraulic pressure is available to operate the knotter. The knotter control valve can be manually activated by depressing the manual control pin on the end of the feed fork solenoid valve. This will help to confirm if failure of the knotter is due to an electrical or hydraulic problem.

⚠ CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

Operate the tractor PTO and use the manual control pendant to position the plunger in the fully extended position.

⚠ CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating. Disengage tractor P.T.O. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler to cease before inspecting, adjusting or servicing baler.

Disengage the tractor PTO and shut off the tractor. Manually position LS 11 in the operated position. The meter bar can be raised to operate LS 11 or the lever arm of LS 11 can be held in the operated position with a piece of string.
With the tractor PTO disengaged, power switch on and mode selector in the "AUTO" position check for 12 volts at TB 2-2. If voltage is available at TB 2-2 it confirms that relay 1 is released. Check for 12 volts at TB 3-3. If voltage is available at TB 3-3 it confirms that power from relay 1 is available through LS 4. Check for 12 volts at TB 3-2. If voltage is available at TB 3-2 it confirms that power is available through LS 11. If voltage is available at TB 3-2 but is not available at TB 1-6 relay 3 may be defective.

Density System

The density system is pressurized by a small hydraulic pump mounted on the main drive unit. If the tractor PTO is operating at a sufficient speed and the power switch is off, the density system will apply pressure to the restriction rails. Pressure from the density pump is not applied to the restriction rails at low PTO R.P.M. A bypass valve diverts flow back to the to prevent possible damage to the pump due to overheating. During operation of the baler in the auto mode, pressure is applied to the restriction rails only during plunger advance. If a problem with the density system is suspected perform the following checks. For more information on the density system see page 72.

⚠ CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating. Disengage tractor P.T.O. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler to cease before inspecting, adjusting or servicing baler.

Check the density pump drive belt. Adjust according to the instructions listed in the operators manual.

Check the manual shut off valve. A shut off valve is located below the density pressure regulator valve on the right hand front corner of the machine. This valve must be open to allow pressure to reach the restriction rails.

Check operating pressure of the density system. Install a 5000 psi gauge to the gauge port at the bottom of the density system regulator valve assembly. Operate the tractor PTO at at least 500 R.P.M. With the power switch "OFF", the restriction rail cylinders should apply force to the restriction rails. Pressure reading when operated as described above should be 2150 psi. If maximum obtainable pressure is not 2150 psi check for internal leakage in the restriction rail cyliners. The pressure regulator valve, bypass valve or pump could be also faulty.

⚠ CAUTION: Stay clear of the baler when operating. Stay clear of all moving parts. Keep all others away from the baler while operating.

Check the operation of the density system unloader valve. Have an observer watch the restriction cylinders as the baler is operating. If the system is operating correctly the restriction cylinders will apply pressure to the restriction rails as the plunger advances. When plunger pressure reaches a predetermined point (set by adjustment of the unloader valve) density pressure will be released. As the baler operates this process appears as a sort of breathing action of the restriction rails. If this does not occur the unloader valve could be faulty.

⚠ CAUTION: Disengage tractor P.T.O. Shut off tractor engine and lock transmission and/or brakes and wait for all motion in baler to cease before inspecting, adjusting or servicing baler.

Check the operation of the density control solenoid. The density control solenoid is energized when the baler is operating in the Auto mode and the plunger is not advancing. Anytime the density control solenoid is energized no pressure is applied to the restriction rails. With the tractor PTO disengaged, power switch on and selector switch in "AUTO", check for 12 volts at TB 4-11 to see if power is available to the solenoid. Check for 12 volts at TB 4-8. A 12 volt reading at this point confirms that power is passing through the solenoid.

MAIN SYSTEM CHARGE PRESSURE

The charge pump supplies cool fluid to the main system, keeps the system charged, and supplies fluid to operate the displacement controller. Charge pump flow exits the system and circulates through a heat exchanger before being filtered and returning to the reservoir. The charge system maintains 350 to 400 PSI on the entire system. Charge system oil circulates through the charge flow filter, the 400 PSI charge system relief and back to the reservoir. Main system charge pressure is utilized as pilot pressure to activate the Feed Fork and Knotter directional valves. Insufficient charge pressure can cause several problems. Check charge pressure according to the procedure listed in the operators manual.