

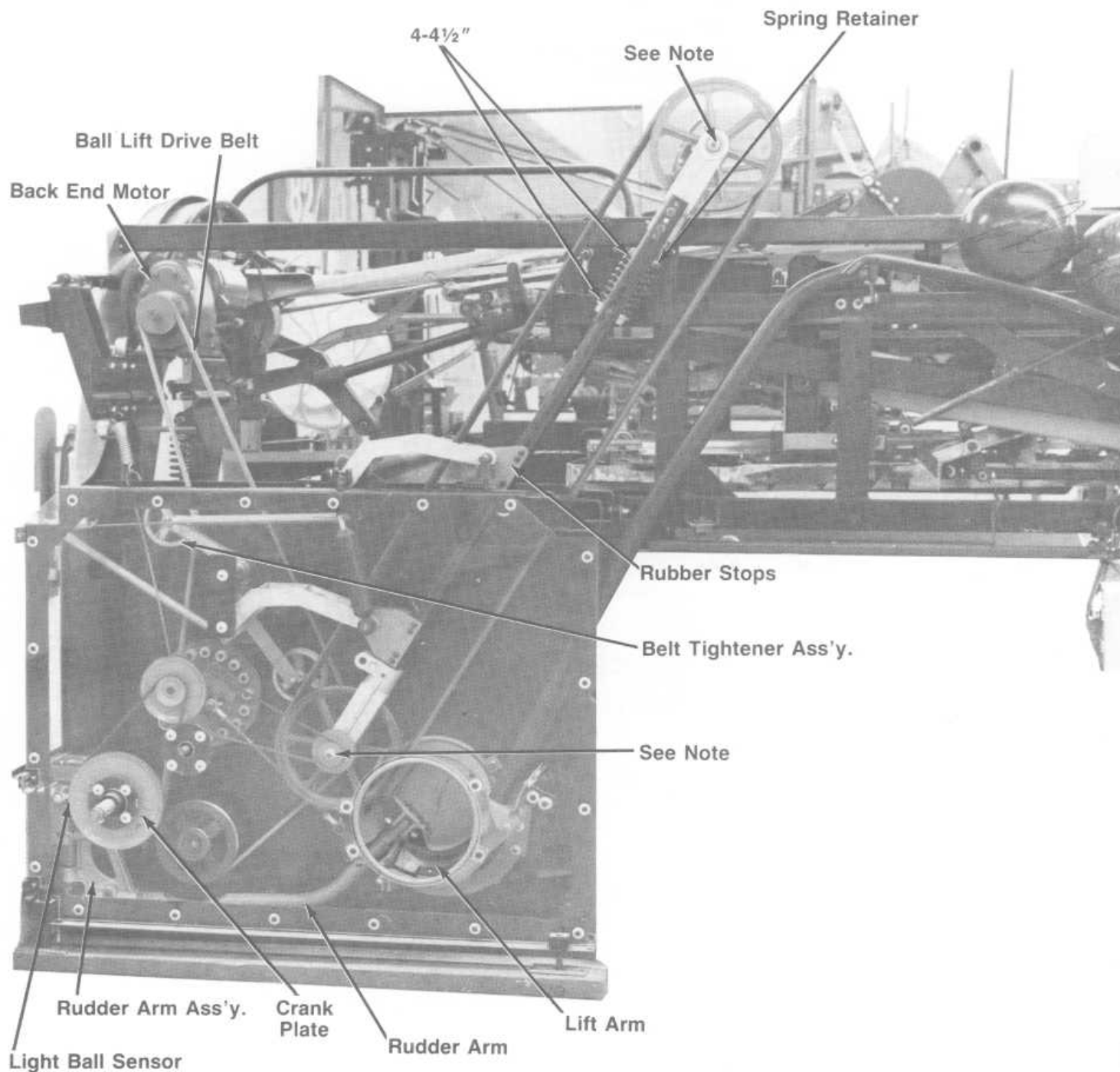
ADJUSTMENTS AND PROCEDURES

Section 5

Page Reference

5.3	Ball Lift
5.27	Bin Switch
5.57	Carpet
5.54	Chassis
5.57	Cushion
5.37	Cushion Shock
5.42	Distributor
5.44	Distributor Cam Timing
5.28	Off Spot Switch
5.52	Pin Ejector
5.41	Pin Guide Rail
5.51	Pin Seating Rod
5.59	Preventative Maintenance
5.53	Printed Circuit Board
5.21	Respot Cells
5.26	Respot Cell Protection Switch
5.50	Shuttle
5.39	Spot and Respot Lever Springs
5.36	Spot Solenoid
5.58	Start Switch
5.18	Sweep Cams & Levers
5.20	Sweep Linkage
5.56	Sweep Motor
5.31	Table Adjustments
5.29	Table Cams & Levers
5.55	Table Motor
5.35	Table Repositioning
5.38	Table Springs
5.40	Yoke

Note: On Those Models with Flange Nuts
on Both Ends of Shafts, Torque to
725-750 Inch-Pounds
60.5-62.5 Foot-Pounds
8.36-8.64 M-Kg.
(Not Required With "D" Bore Shaft)



BALL LIFT OPERATION

The purpose of the ball lift is to raise the ball high enough to permit a gravity return to the bowler. The area in which the ball travels must be free of burrs and all assemblies and bolts must be tight. The lift must be in line with the tube assembly or the ball will jump the track. The shock absorber lowers the lift gently and also acts as a ball spacer.

BALL LIFT REMOVAL

1. Remove springs from belt tightener assembly.
2. Remove ball lift drive belt and idler belt from sheave assembly.
3. Remove studs from lower ball lift shaft mounting brackets.
4. Remove studs from upper shaft mounting brackets. Lift ball lift out of brackets.

REPLACEMENT

1. Position upper and lower ball lift shafts in brackets on kickbacks. Lift should be in line with ball return tube assembly. Adjust upper and lower shafts accordingly. (See Note)
2. Replace studs.
3. Replace drive belts and belt tightener assembly.

ADJUSTMENT (Kicker Lift Only)

1. Visually inspect ball kicker assembly. It should be centered between side plates and within 1/16" from side plates. Rearrange spacer washers if necessary.
2. Visually inspect rudder arm assembly. It should be centered and move freely between side plates and should stop flush with inside of metal kickbacks. Adjust rudder crank plate assembly accordingly.
3. Place ball under lift and adjust rubber bumpers so that the bottom of the ball lift just touches the ball. Tighten lock nuts. (NOTE: Shock adjusting nut should be tightened all the way down before rubber bumpers are adjusted.) Turn back end motor on. If ball fails to enter lift, adjust upward. If ball enters lift but idles at bottom of lift, adjust downward.

BALL LIFT BELT ADJUSTMENT

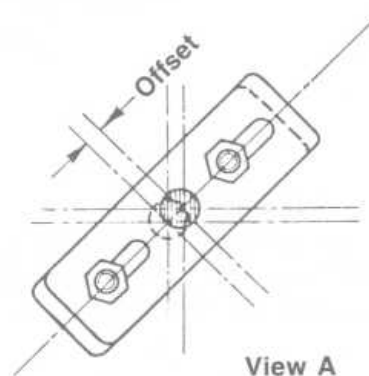
If the belt rubs against the tube assembly when the ball is elevated, adjustment is necessary. Use a spanner wrench and rotate the spring retainer until the overall dimension of the spring is 4-4½ inches.

NOTE

Adjustable Ball Lift Support Shafts are provided to allow alignment of the Ball Lift to the track rails.

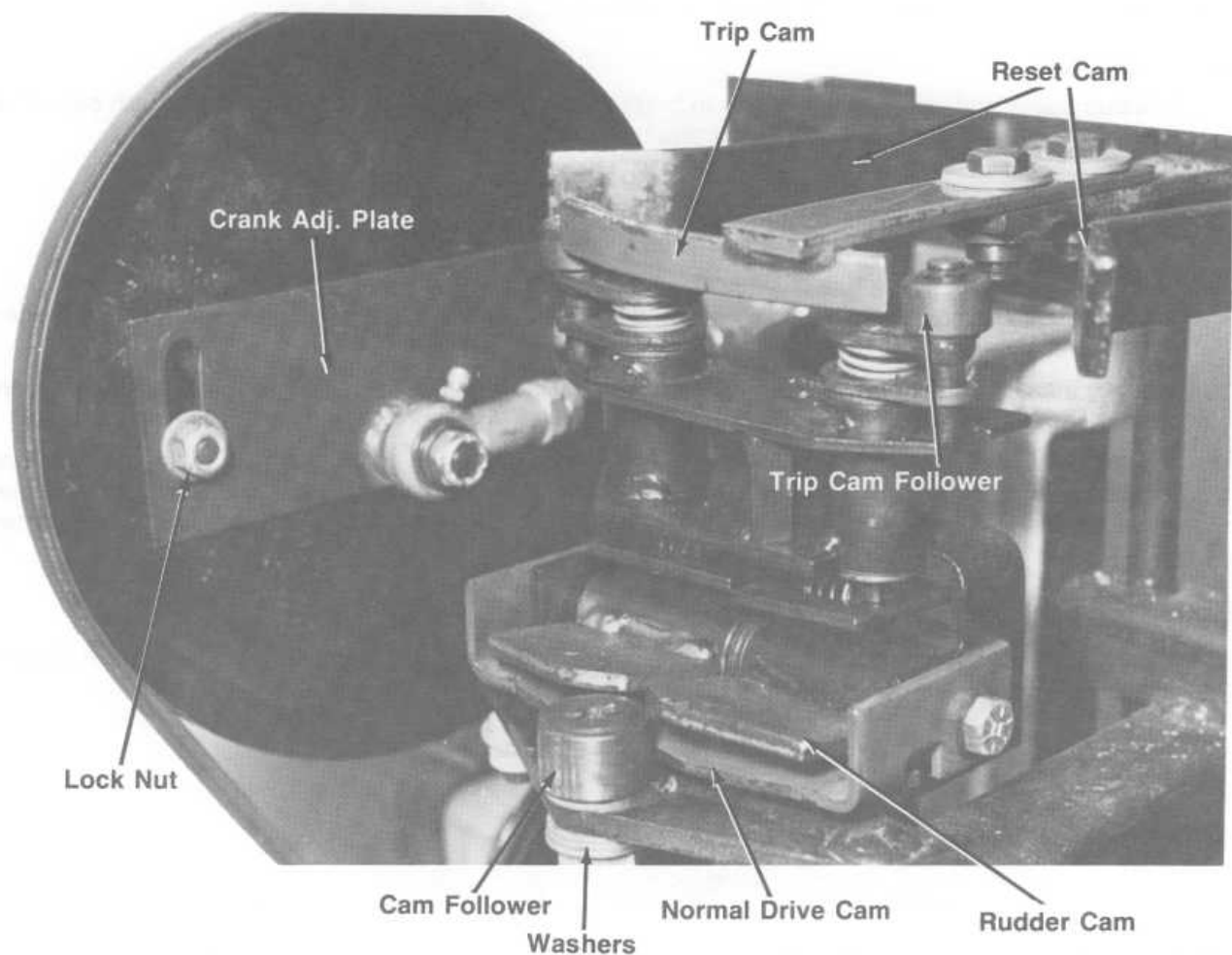
Adjustment is required when the Shaft Supports on the metal Kickback Assemblies are not aligned.

Alignment is achieved by turning plates on the Support Shaft Assemblies till the plates are parallel to the direction of offset. (See view A.)

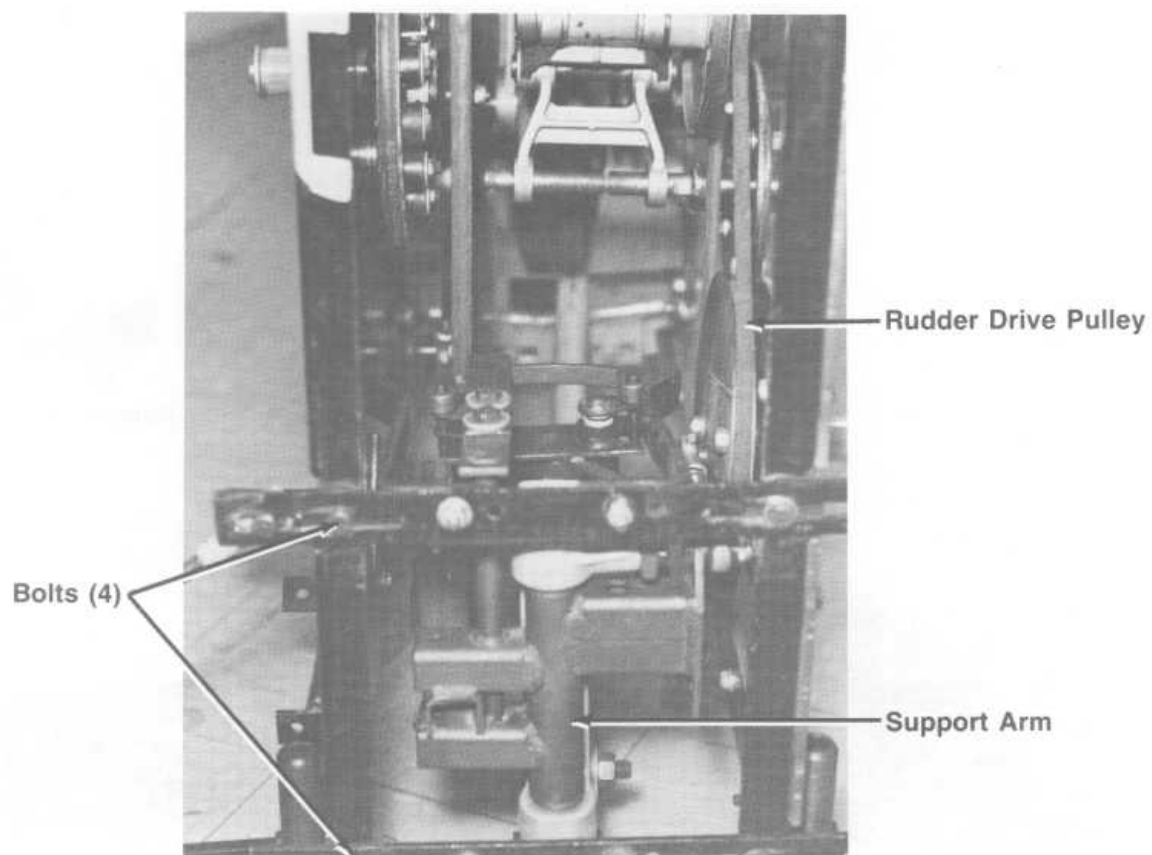


POSITIVE BALL LIFT ADJUSTMENTS**NOTE**

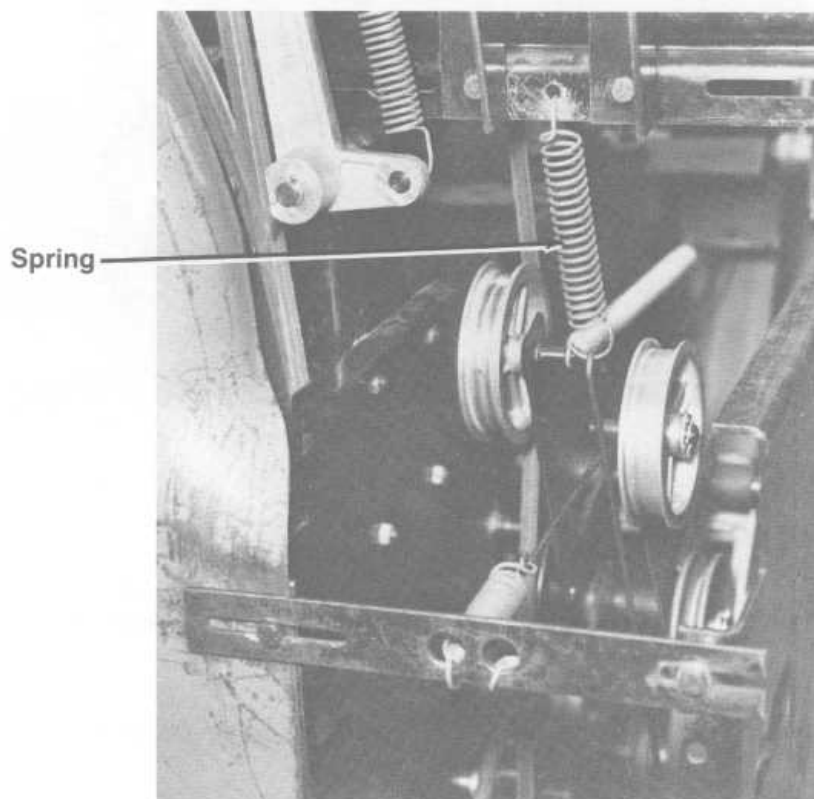
1. Pull power plugs of the pair of machines to be adjusted.
2. All adjustments must be made in the proper sequence.
3. Do not skip any steps.
4. After making an adjustment, recheck before proceeding to the next step.

**SENSOR ASSEMBLY**

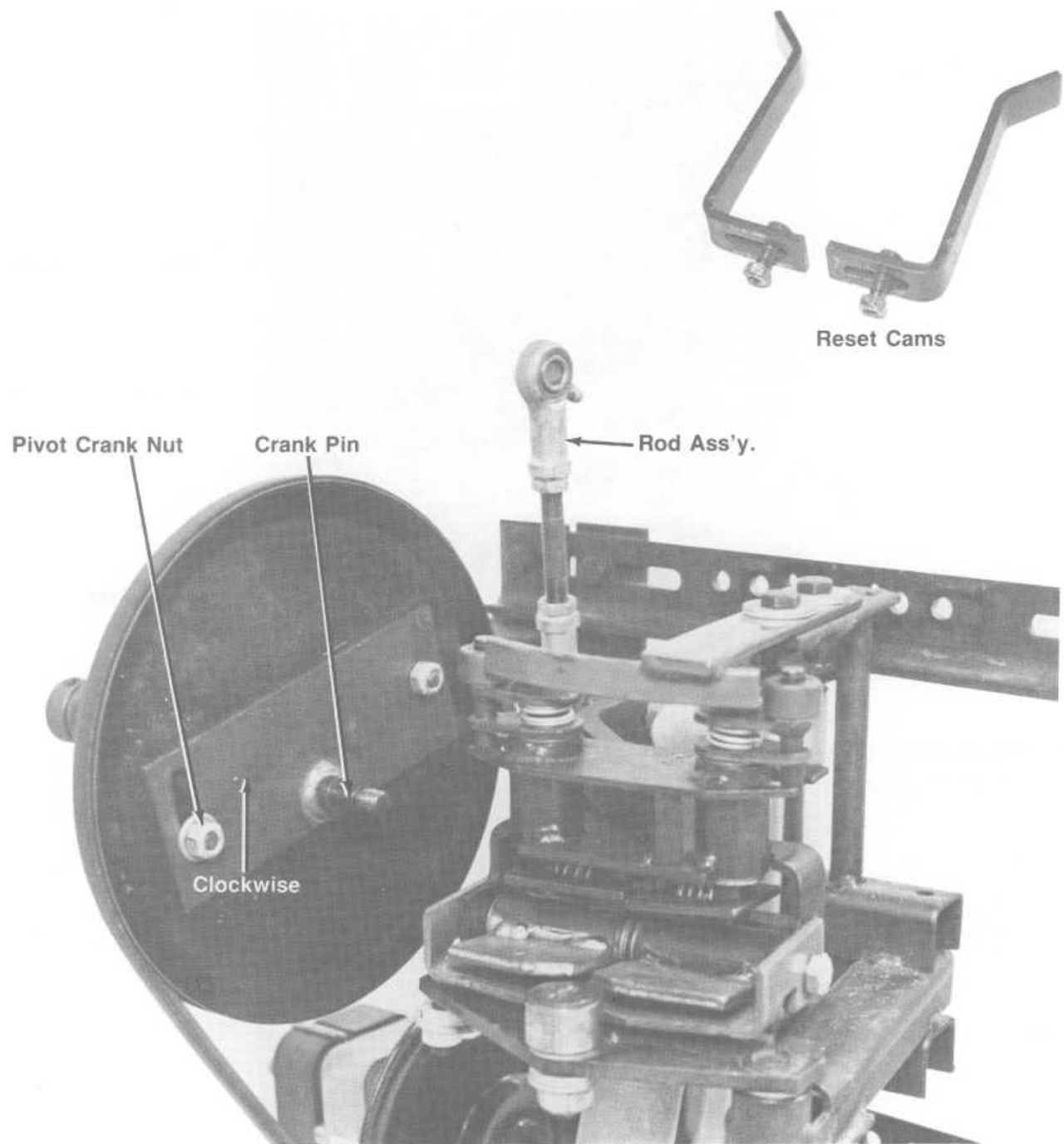
1. Cam follower roller must be low enough so it will slide under rudder cams when paddle movement is blocked, also high enough so rudder cams will lock behind it in the power drive position. Washers are provided so the height of the cam roller can be adjusted.



1. Ball lift sensor support arm should be centered between side plates. Measure with rule.
2. Loosen bolts and adjust if necessary.

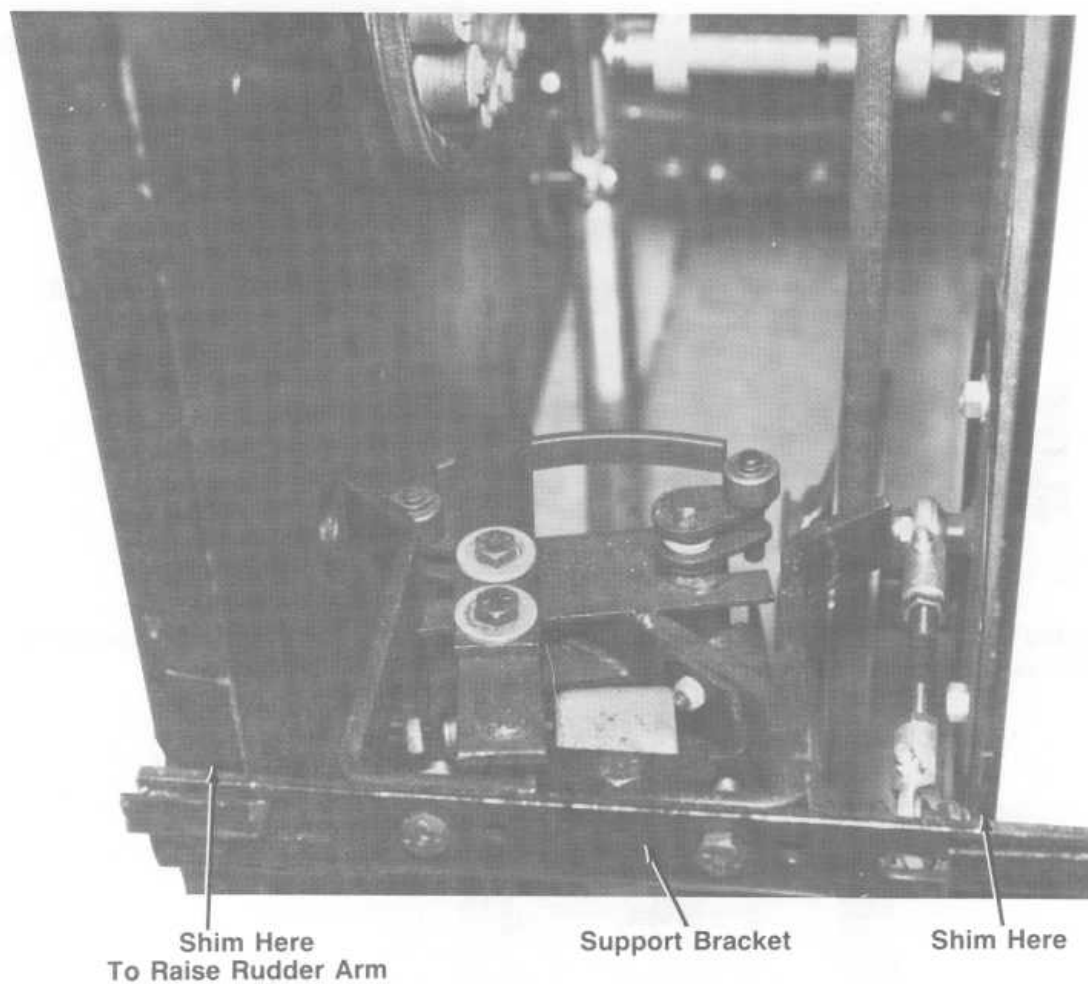


3. Remove spring from belt tensioner assembly and remove belt from rudder drive pulley.

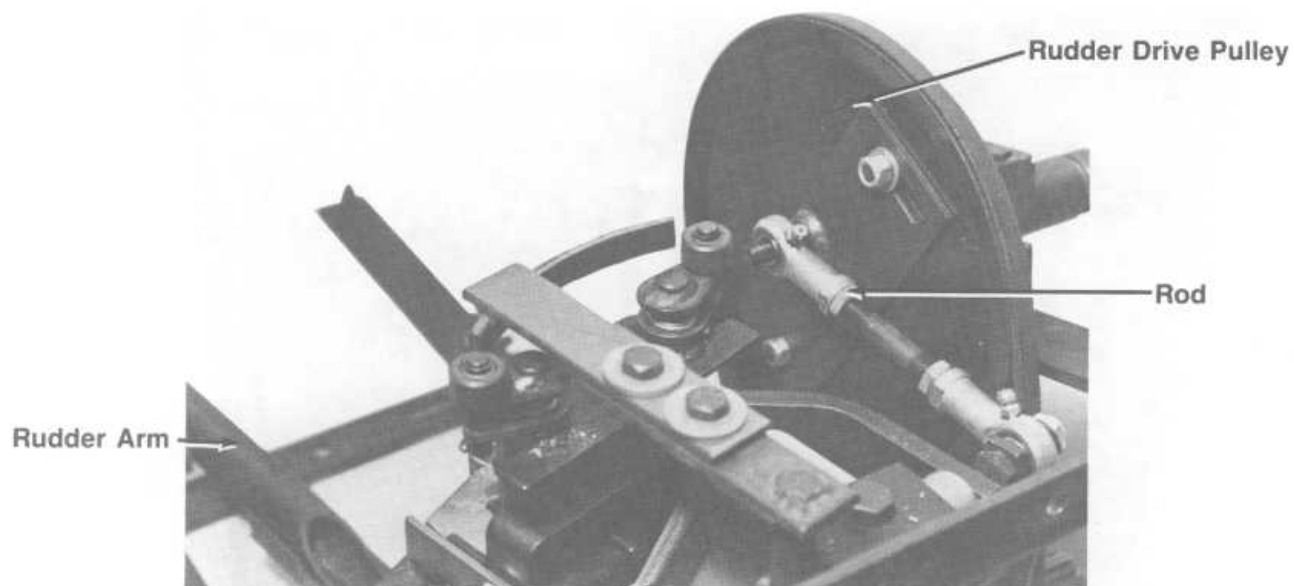


RUDDER AND SENSOR ADJUSTMENTS

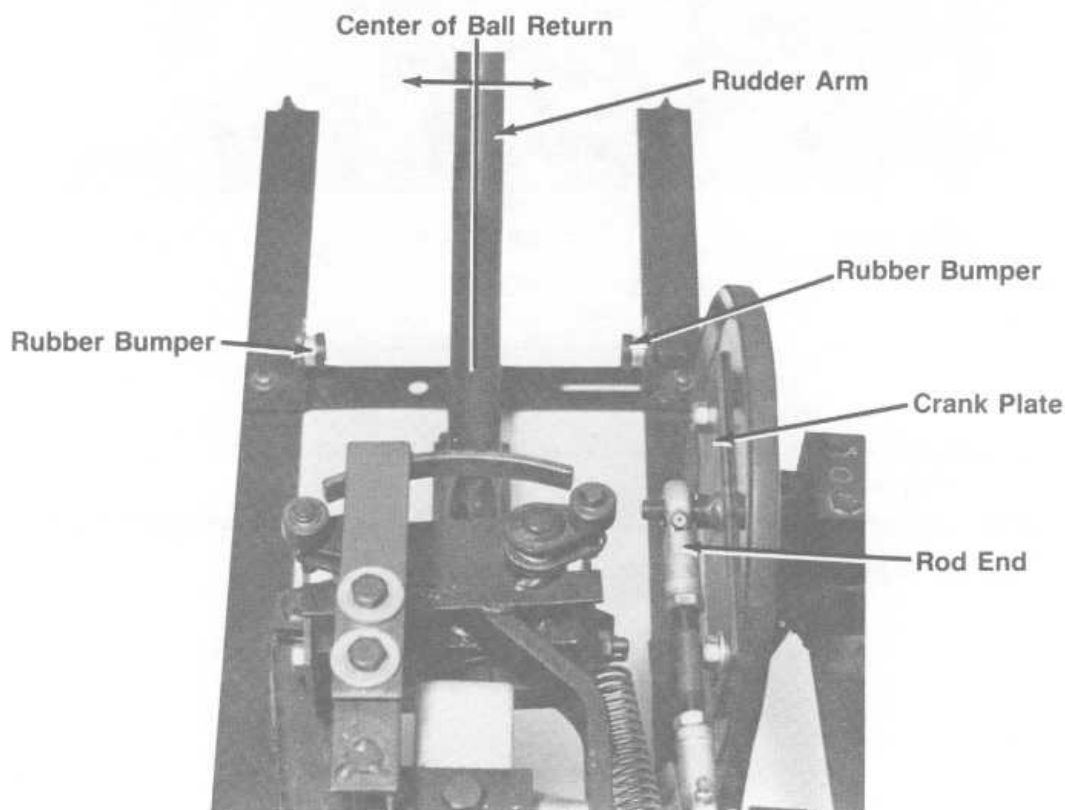
1. Remove retaining nut from crank pin and save.
2. Remove rod assembly from crank pin and swing out of the way so sensor assembly can be moved manually.
3. Remove both reset cams.
4. Loosen pivot crank nut and turn adjusting plate to full clockwise position, then snug lock nut. (Minimum rudder arm travel.)



1. Move sensor assembly back and forth so rudder arm touches rubber bumpers on each side plate. It should move freely with no interference.
2. If there is any interference it may be necessary to shim the rudder arm support bracket.
3. Sensor must swing freely and be centered between machines.



1. Place free end of rod assembly on crank pin (see above) and pivot sensor assembly by manually rotating the rudder drive pulley to observe travel of rudder arm.

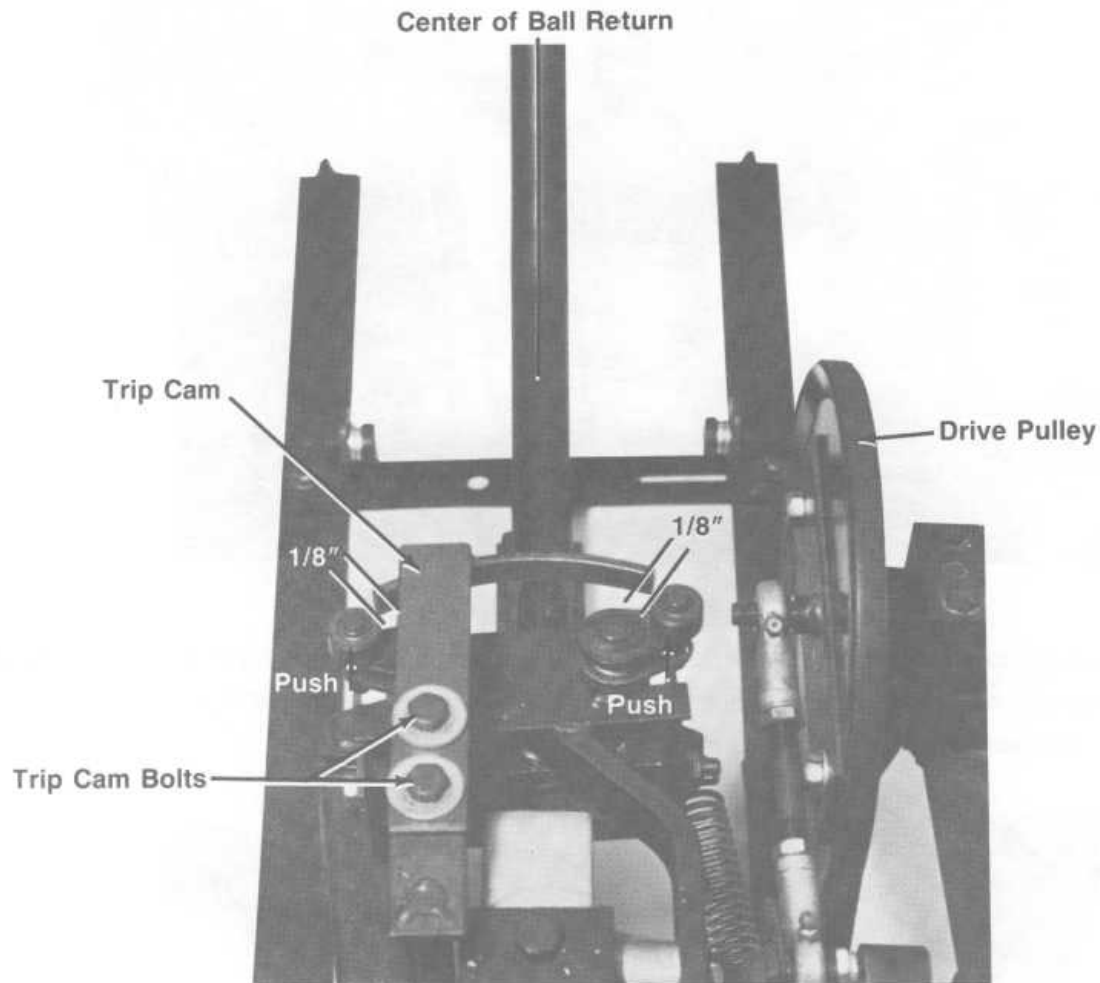


2. Adjust rod so rudder arm swings equally to the left and right of the center line position (see above), then install lock nut.

NOTE: To adjust to the left shorten the rod. To adjust to the right, lengthen the rod. Rod assembly has right hand thread on both ends, so rod end must be removed to make adjustment.

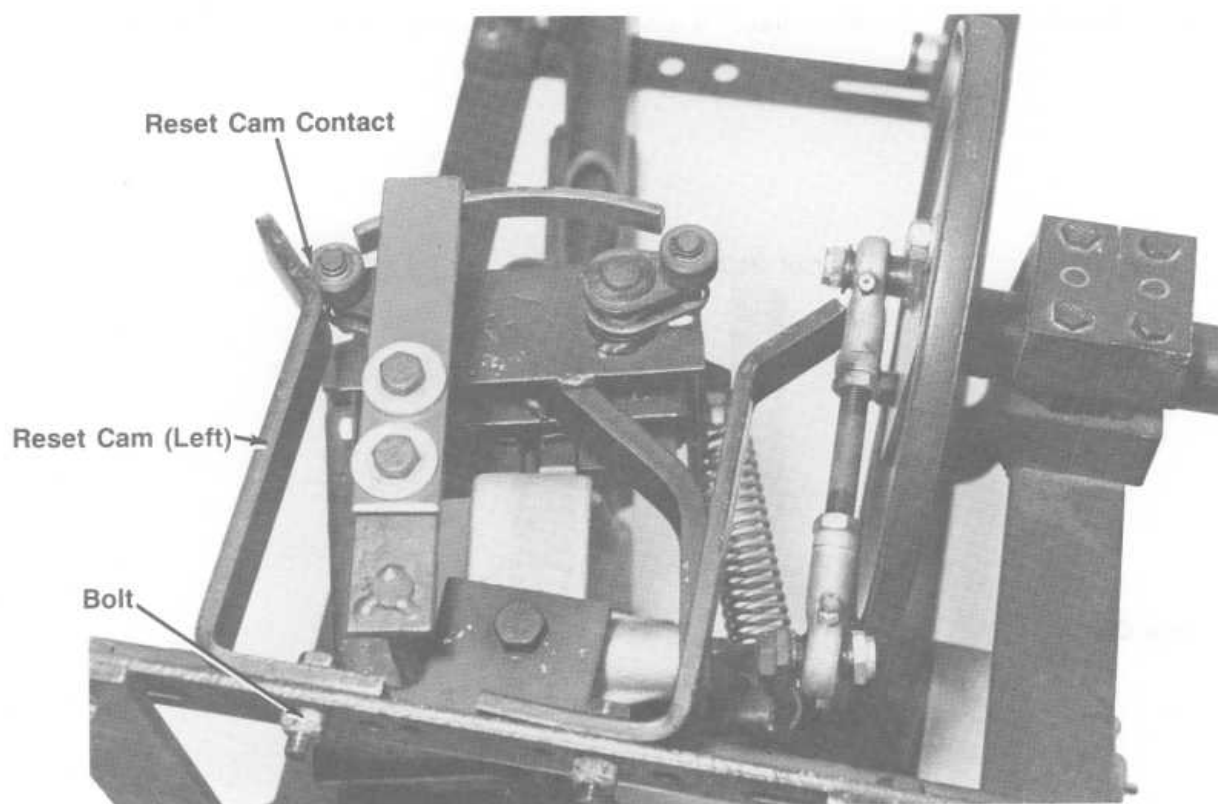
3. Loosen lock nut on crank plate and move plate in a counterclockwise manner until the rudder arm touches each bumper on the left and right side of the side plate with equal force without actuating trip cam follower. Tighten lock nut.

4. Rotate rudder drive pulley to recheck travel. If rudder hits one bumper and not the other, repeat step 2.



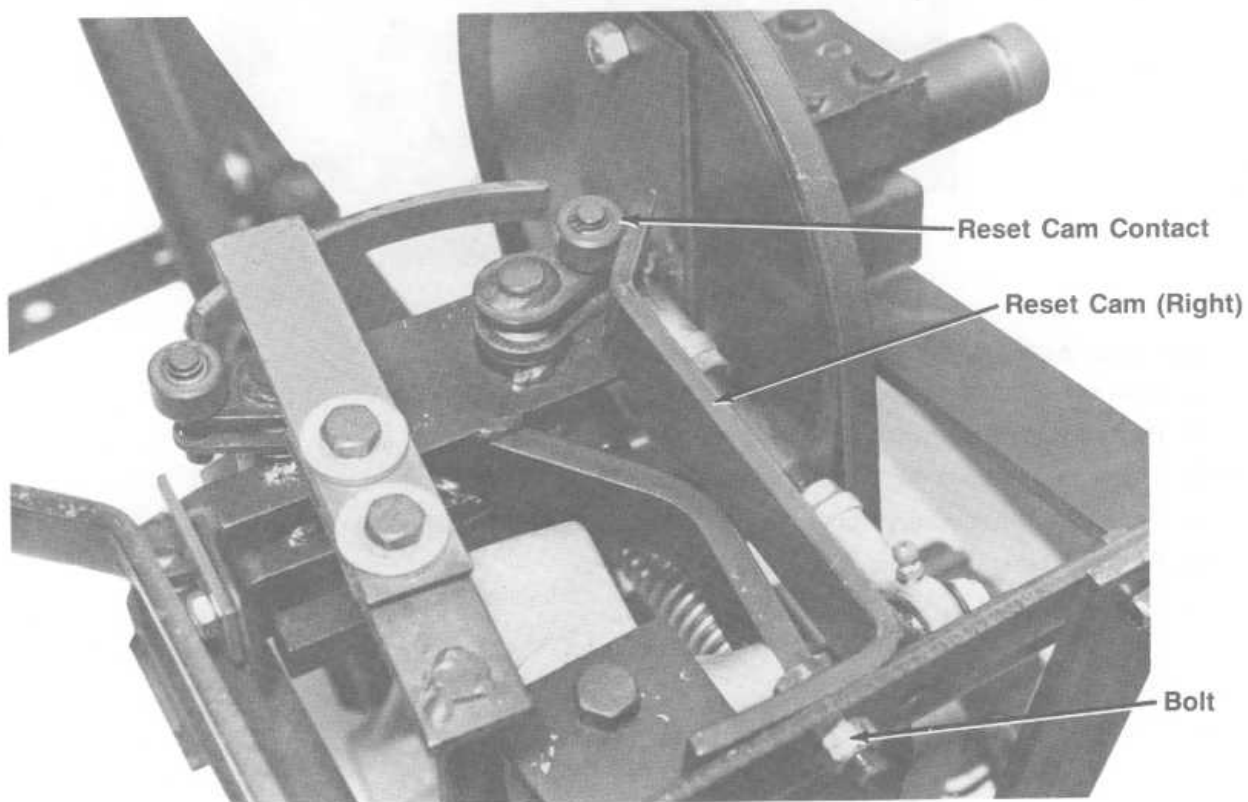
TRIP CAM AND RESET CAM ADJUSTMENT

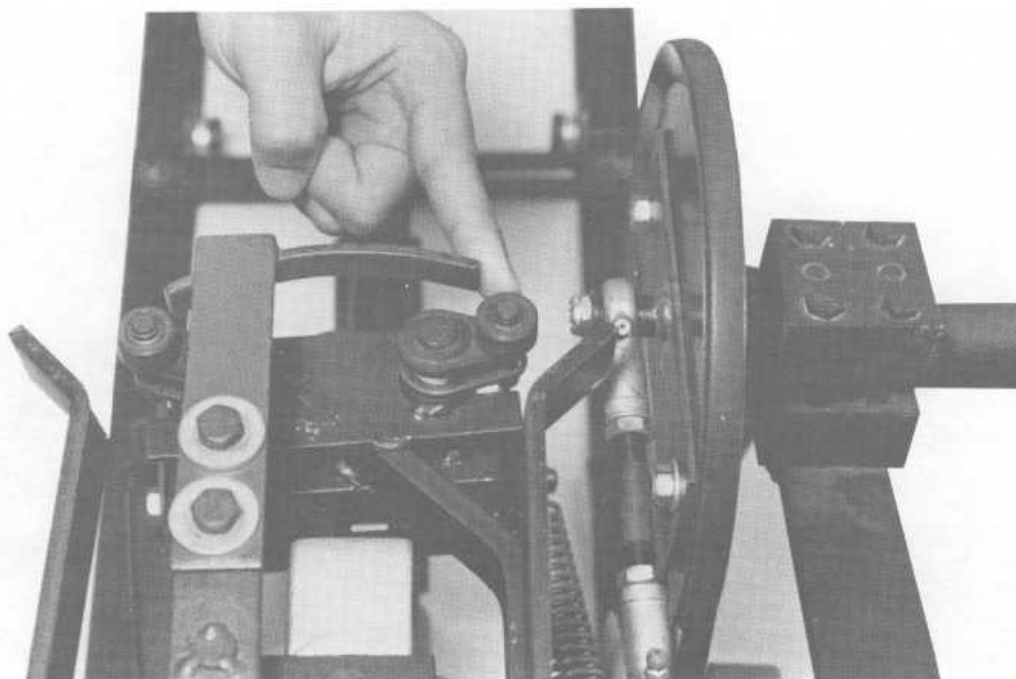
1. Turn drive pulley to place rudder in the center of its travel. (Center of ball lift.)
2. Push trip cam followers forward to the maximum position.
3. There should be a 1/8" gap on each side between the trip cam and rollers.
4. To adjust, if necessary, loosen trip cam bolts, reposition cam, then tighten bolts.
5. Recheck clearance after tightening.



RESET CAM

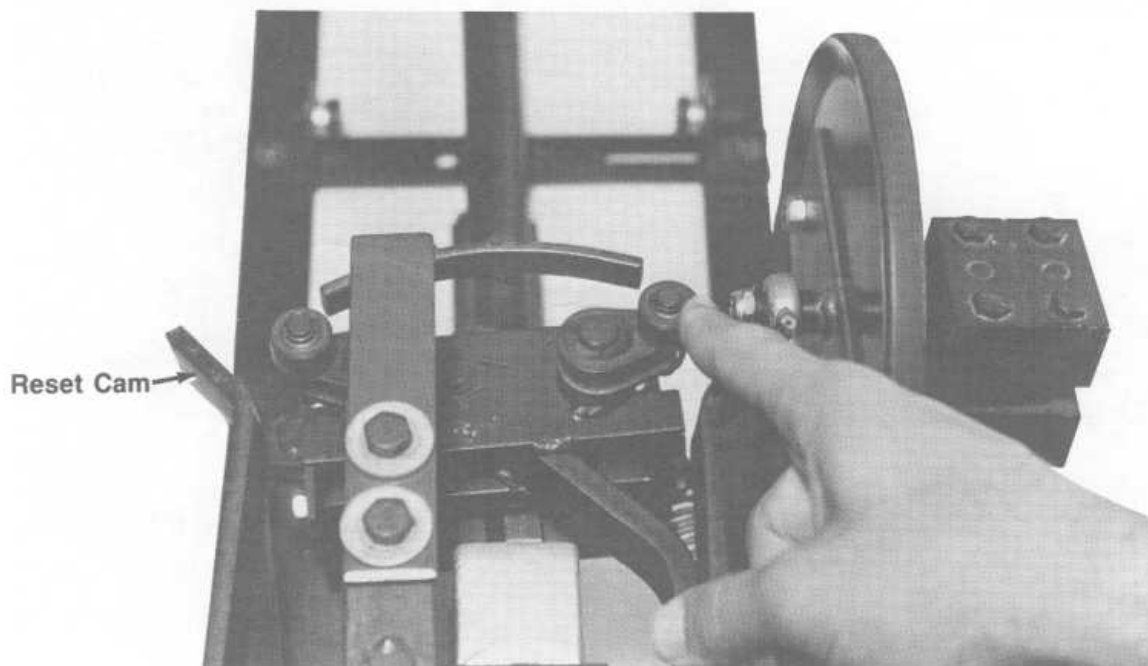
1. Turn drive pulley to place rudder arm to its furthest travel to strike bumper (left side) and hold this position.
2. Install reset cam and move angled surface to touch trip cam follower. Tighten bolt.
3. Repeat above steps 1 and 2 with other reset cam. (Right side below.)

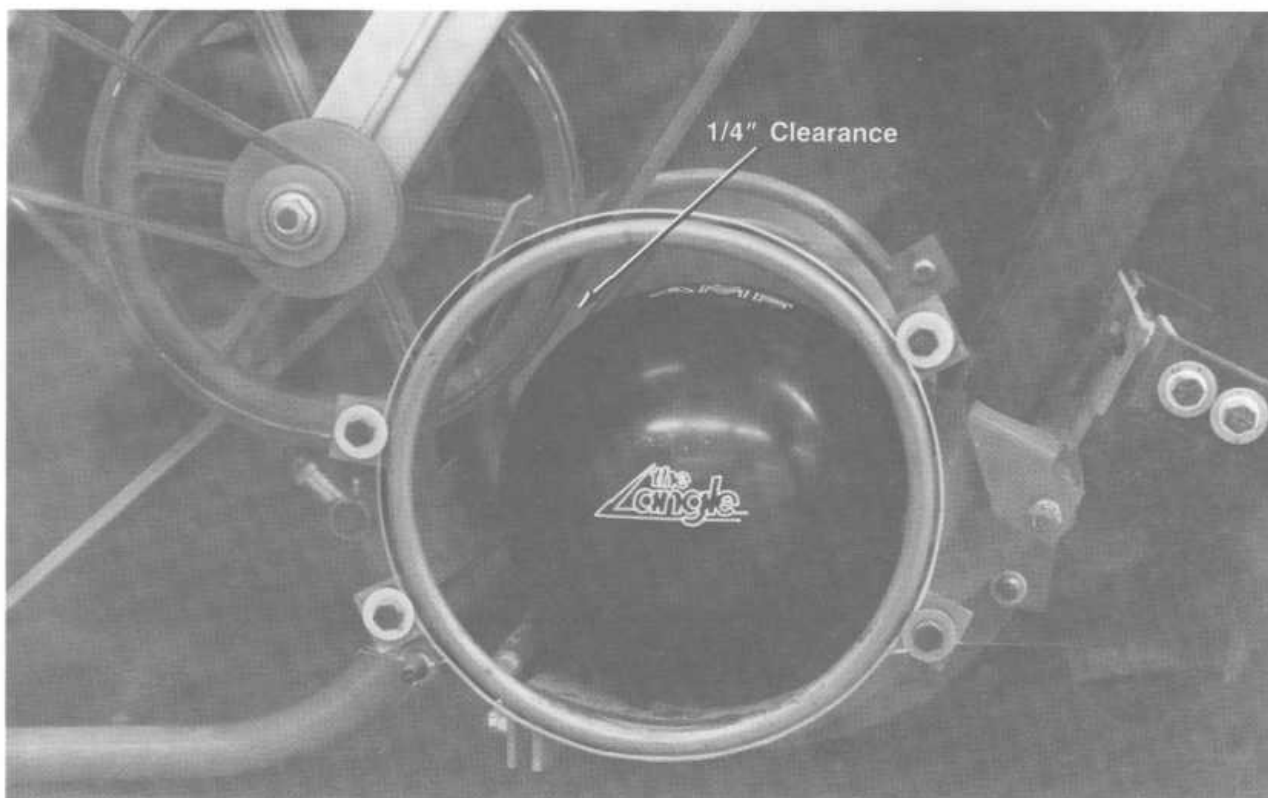




CHECKING RESET CAM

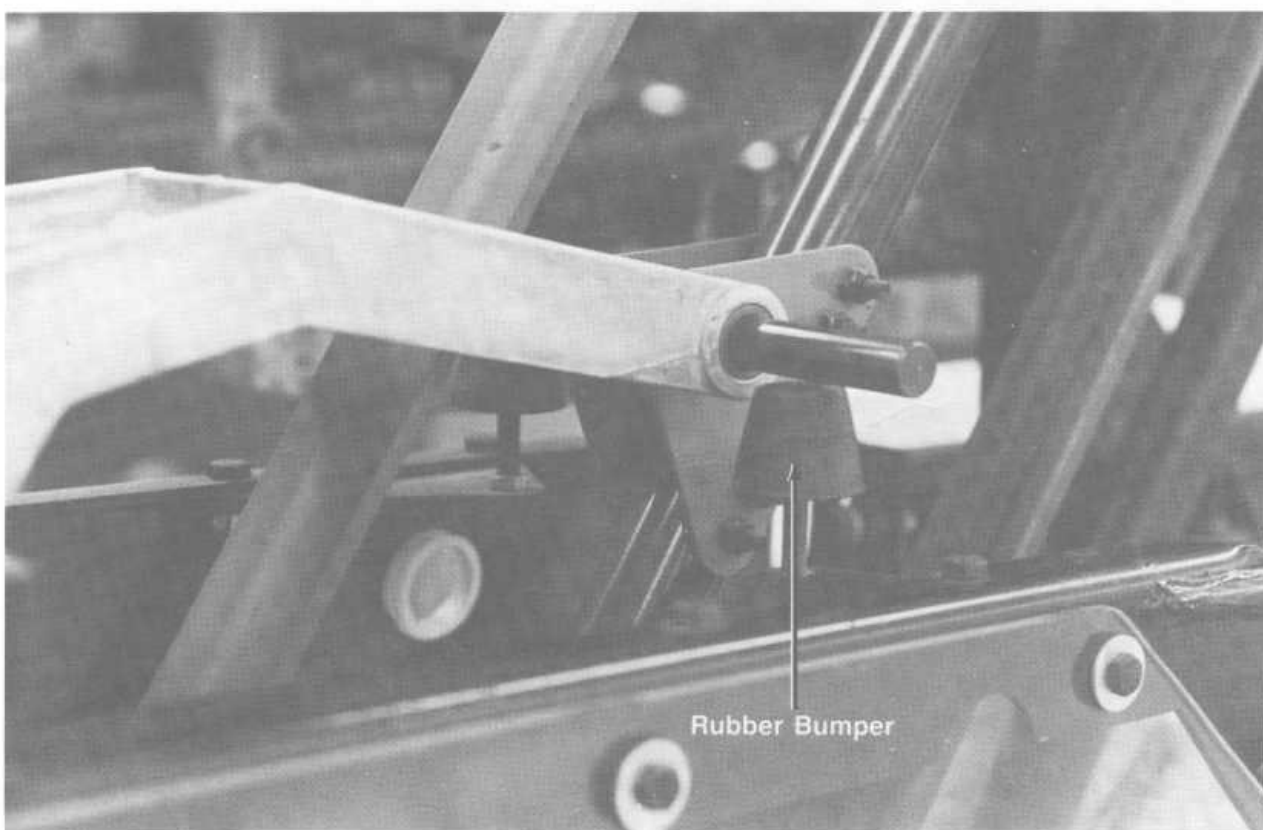
1. Manually rotate the rudder drive pulley.
2. While sensor is moving back and forth, move cam follower roller towards rear of machine.
3. Wait for roller to strike reset cam, returning it to its normal position (forward).
4. Manually push roller forward to check that reset cam returned to its forward position, if so, reset cam is properly adjusted. Check the other roller in the same manner.
5. Install belt on rudder drive pulley. Replace spring on belt tensioner.
6. **CAUTION:** Apply power to machine, back end switch (on), table and sweep switches (off).
7. Retest operation of rollers again as above. Use screwdriver or wood stick to actuate roller; if roller does not return to its forward position properly, **readjust reset cam again.**

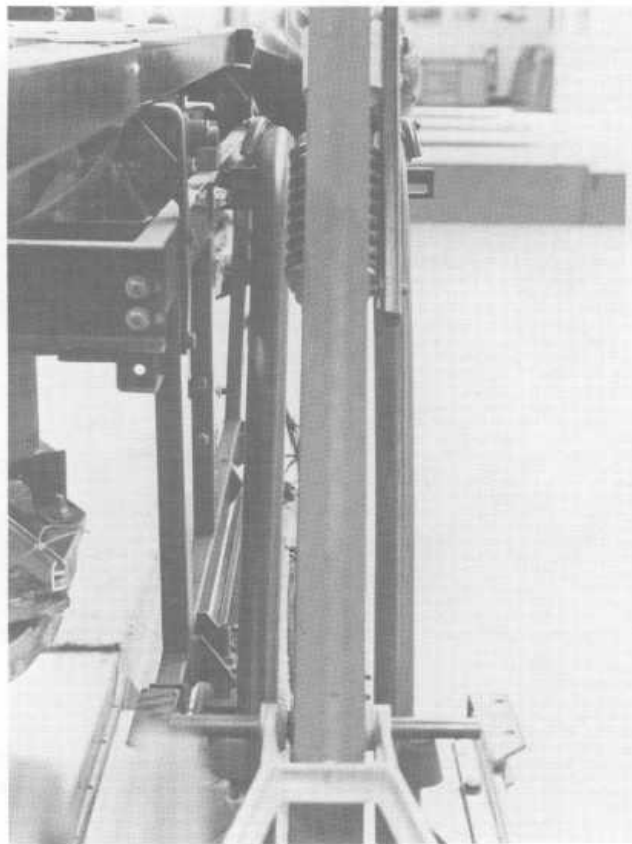




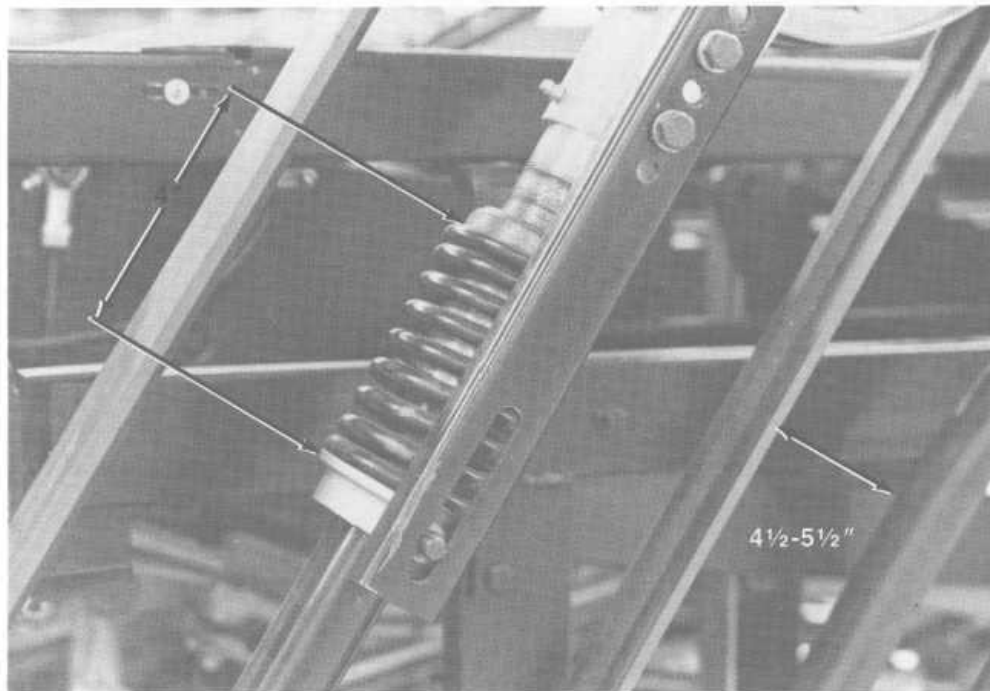
BALL LIFT ADJUSTMENT

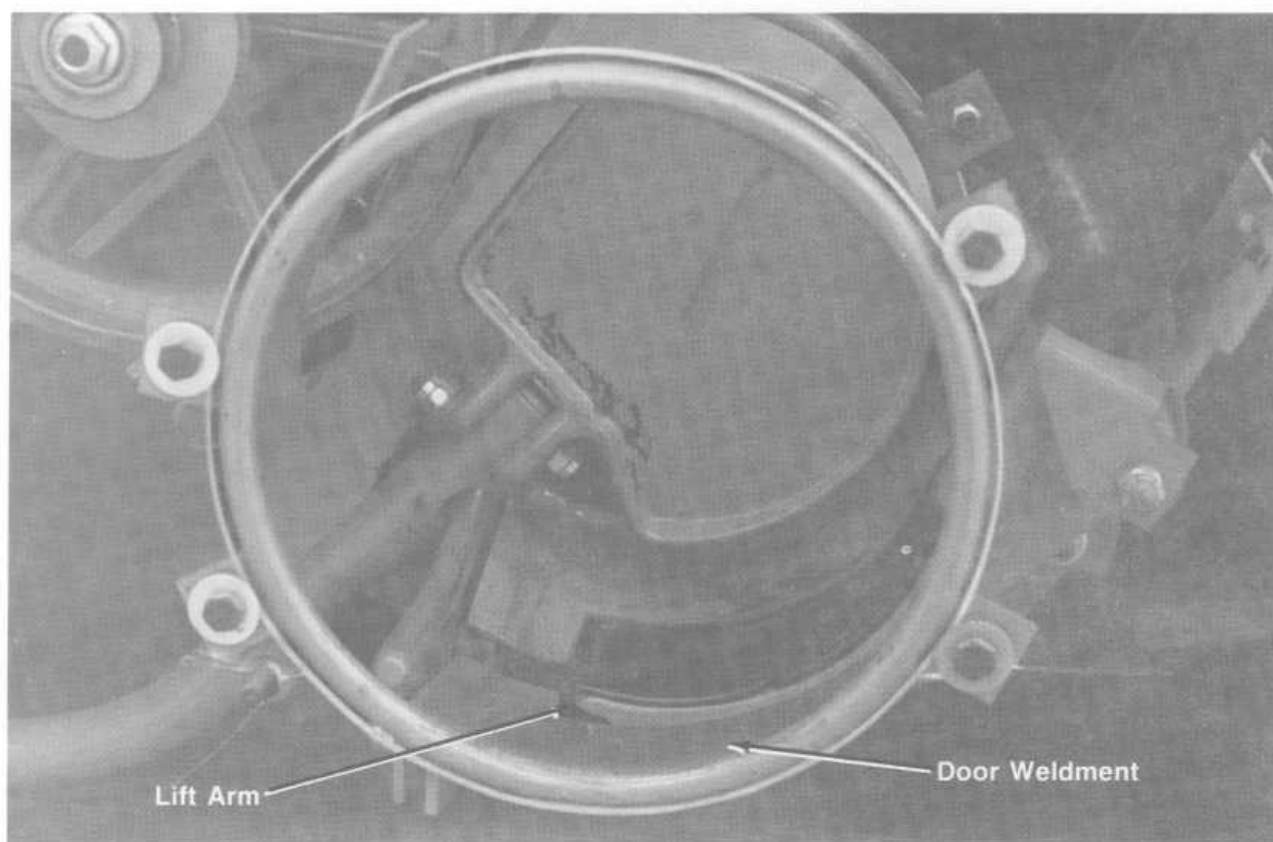
1. Place ball on lift arm assembly. Adjust rubber bumper to have 1/4" between ball and ball lift. (See photo below.)



**BALL LIFT ASSEMBLY**

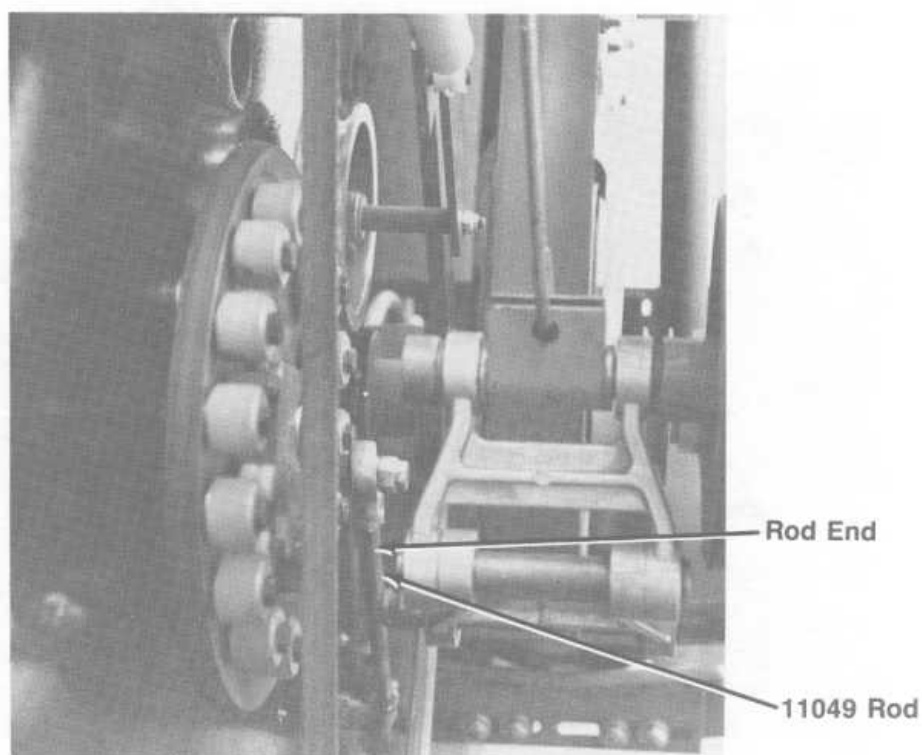
1. Ball lift assembly must be centered with return rails. (See above.)
2. The distance between the ball lift belt and return rails should be $4\frac{1}{2}$ - $5\frac{1}{2}$ inches.
3. Adjust rubber bumper to obtain this dimension. See photo below.
4. Lift belt tension spring should be compressed to 4" for proper tension on lift belt.

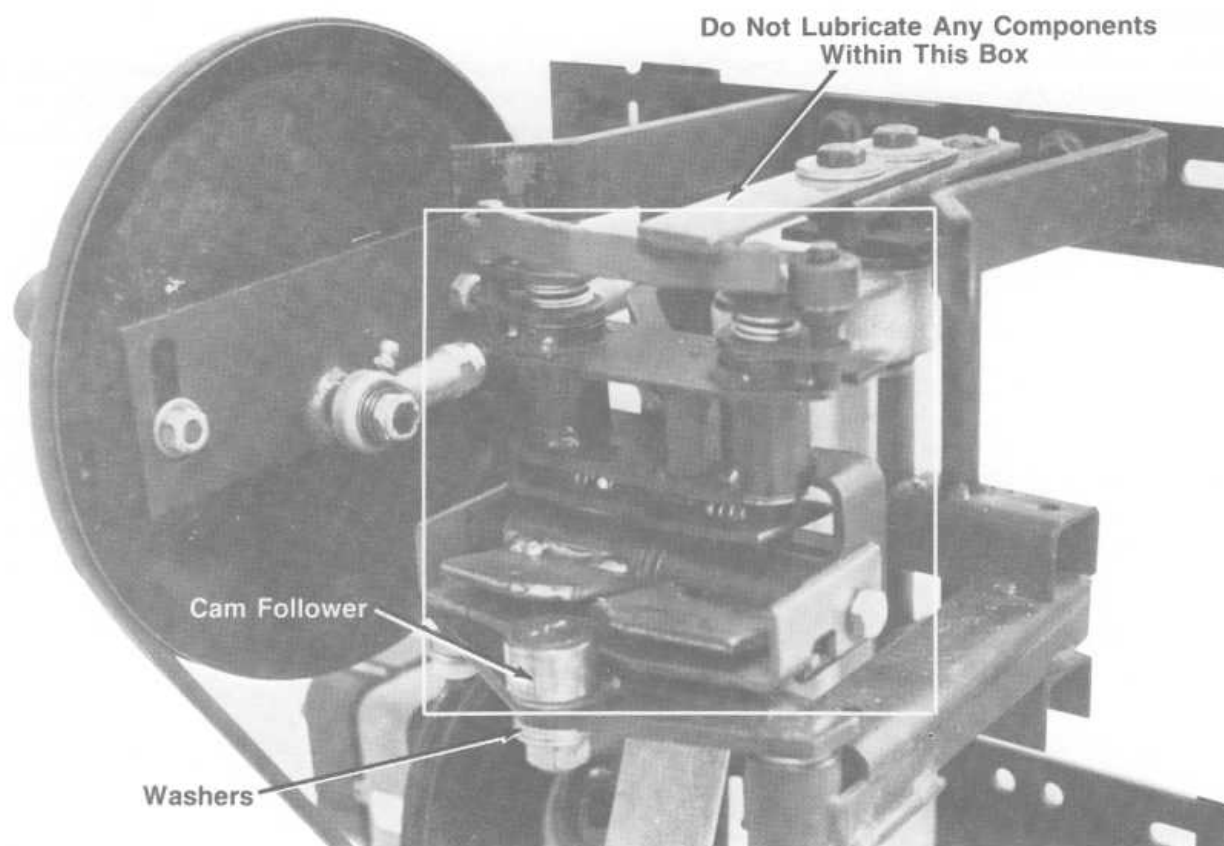




LIFT ARM ADJUSTMENT

Lift arm should be 1/8 to 3/16 inch above door weldment. The 11049 rod assembly controls this. Rod length should be approximately 15½ inches. (11049 rod has right hand thread on both ends.) It must be disconnected at one end to make adjustments.





SENSOR ASSEMBLY

1. Cam follower roller must be low enough so it will slide under rudder cams when paddle movement is blocked, also high enough so rudder cams will lock behind it in the power drive position. Washers are provided so the height of the cam roller can be adjusted.
2. This completes the adjustments on the positive ball lift. Install guards on machine, apply power and observe operation as balls enter the ball lift.

LUBRICATION

1. Lubricate ball lift and associated parts every three months, the location, amount, and type of lubricant is called out in the lubrication section of the service manual.

NOTE: Do not lubricate component parts of the trip cam and rudder cam assembly, outlined within square, see photo above. Friction is required in this area to allow the sensor to operate properly.

SWEEP CAM LEVERS AND CAMS OPERATION

The purpose of the sweep cams and levers is to control the sweep operation during the down (66° position), run through to 270° position, and up to zero position. Sweep should operate smoothly in all locations and should not rub the machine or lane bed. The cams and switches also control the timing of table movement and interlock protection (TB & SC).

ELEVATOR WHEEL RING TUBE REPLACEMENT

(Refer to page 61 in parts section)

NOTE: Remove 110 Volt Power Plug

1. Remove BE guard, pin elevator guard and elevator wheel belt guard.
2. Remove distributor and distributor support. (5.43)
3. Remove hand rail and brace below BE motor.
4. The pin guide rail and Bracket behind it must be removed.
5. If rudder arm support brackets and spring bracket are behind the elevator wheel cover, they must be removed.
6. Loosen one capscrew near the top of the wheel holding a pin holding bracket in place, attach a length of mechanics wire to the screw and fasten the other end of the wire to the bin. This will help hold the wheel in place.
7. Place wood blocking under the wheel to support it. Put additional blocking under the wheel cover to support it also.
8. Remove the four bearing plates from the wheel cover, inspect bearings.
9. Carefully remove the four Cap screws holding the wheel guard to the machine. When the bolts have been removed the Wheel Guard will be free and can be removed being careful not to spill the oil in the ring tube oiler reservoir.
10. After removing the guard, the ring weldment can be removed. Seven bolts attach the ring to the wheel.
11. Install new ring weldment. Reverse the removal procedure to put elevator wheel assembly back together. Distributor adjustments must be checked. (5.43) The pin guide rail must be adjusted. (5.41)

KICKER BALL LIFT

NOTE: Remove power plug from both machines-remove lift guard and back end guard.

LIFT REMOVAL

1. Remove springs from belt tightener assembly.
2. Remove ball lift drive belts from lift pulleys and rudder drive belt from tensioner (careful of spring tension).
3. Remove clamp studs from upper and lower ball lift shaft mountings.
4. Lift ball lift up out of brackets.
5. Inspect lift belt and drive belts.

LIFT REPAIR

1. Remove upper and lower link assemblies. Clean and lubricate shafts and bearings. Check shock absorber.
2. Reduce belt spring tension and remove belt.
3. Disassemble upper and lower shafts. Inspect, clean and lubricate one way clutches and bearings.
4. Inspect pulleys. Replace any worn parts in lift.
5. Reassemble lift. All set screws must be against flat side of shaft. Check one way clutches for direction of drive.
6. Adjust belt tension spring to 4 1/2" overall length (starting measurement).

STARTER PAD

1. Inspect rubber starter pad, shaft, bolt and flange bearings. Replace worn parts.
2. Starter pad assembly should be centered and in line with track weldment.
3. Check track support weldment for loose bolts or being bent.
4. Rotate or replace track covers if worn or cracked.

BALL EXIT

1. Check front and rear segment, filler pad rear, filler assembly front, pad and bumpers.
2. Check all bolts for tightness.

KICKER ASSEMBLY REMOVAL & REPAIR

1. Remove springs from idler arm assemblies. Remove and inspect belts.
2. Remove 3/8 nuts and washers from roller base.
3. Bring kicker assembly out back of machine. Remove rubber rollers.
4. Inspect, clean and lubricate all shafts and bearings. Replace worn parts.
5. Reassemble kicker. Replace rubber rollers, set screw must be against flat side of shaft.

REPLACEMENT

1. Inspect kicker support brackets. Tighten, straighten and align as needed.
2. Install kicker assembly between kickbacks on support brackets. Center kicker assembly between machines, kicker rollers should be between 1/16" and 3/16" from kickbacks. Replace nuts and washers.
3. Washers are used to move roller brackets in or out to accommodate different distance between machine. Move washers from between roller brackets to outside of brackets to move kicker roller away from kickback or from outside of brackets to between brackets to move kicker roller closer to kickback. Idler arm assembly washers should be moved the same as roller assembly washers to assure belt alignment. Kicker assembly must be out of machine to move washers. (See note 1)

RUDDER ARM ASSEMBLY

1. Check for free movement of rudder arm from one rubber bumper to the other. Center and align as necessary.
2. Inspect drive link and bearings. Check for special step washers at drive link bearings. Low side of washer toward bearing.
3. Adjust rudder drive crank plate so piston shaft moves 1/4" to 1/2" into or out of the body of drive link after rudder arm strikes bumper at kickback.

LIFT REPLACEMENT

1. Position upper and lower lift shafts in brackets on kickbacks.
(Drive belts must be in place around lower link before clamp studs are inserted.)
2. Insert and snug clamp studs. Lift must be in line with track weldment. move lift left or right to obtain proper alignment. Use adjustable shaft plates to help alignment if needed. (See note 2) tighten clamp studs when alignment has been obtained.
3. Place a ball under lift and adjust shock nuts or rubber bumpers, depending on the installation, so the bottom of the ball lift belt touches the ball.
4. Check all belts for alignment and tension. Align and adjust as needed.
5. Check lift operation. If the ball enters the exit but idles at the bottom, adjust lift downward. If the ball won't enter the lift, adjust the lift upward, or check kicker roller placement and belt tension.

BALL LIFT BELT TENSION

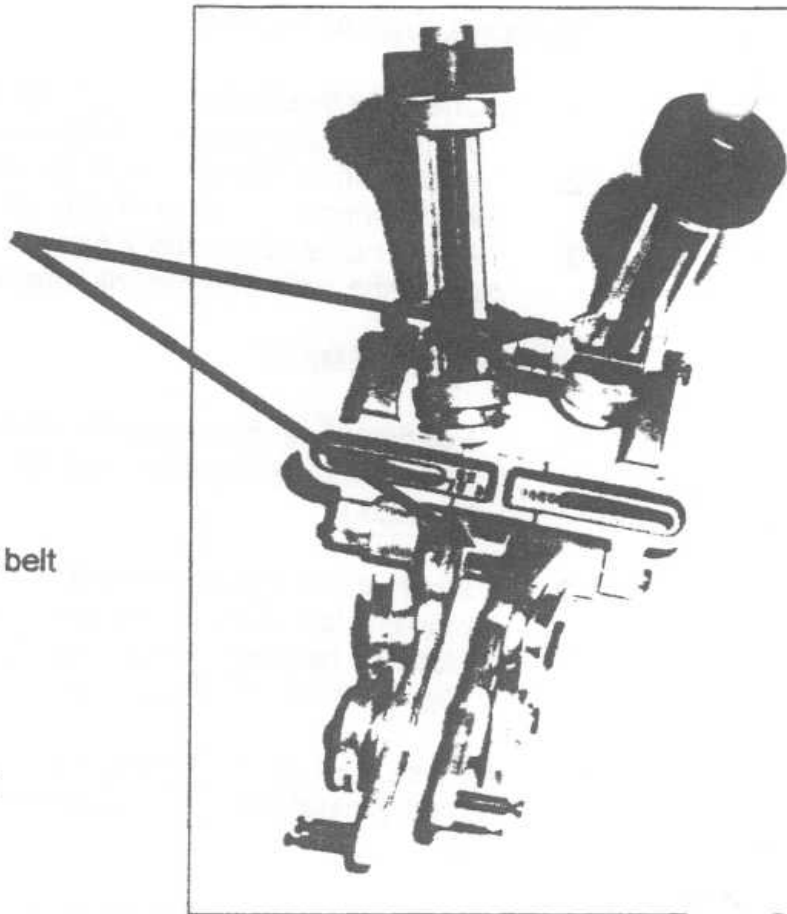
1. If the lift belt rubs against the tube assembly when the ball is being elevated, adjustment is necessary. The smaller the spring, the greater the belt tension. Rotate the spring retainer to compress spring between 4 1/2" and 4" overall length.

(Note 1)

Move washers from between roller brackets to outside of roller brackets to move kicker roller away from kickback.

Move washers from outside of roller brackets to between roller brackets to move kicker roller closer to kickbacks.

Idler arm assembly washers should be moved the same as roller washers assembly washers to assure belt alignment.

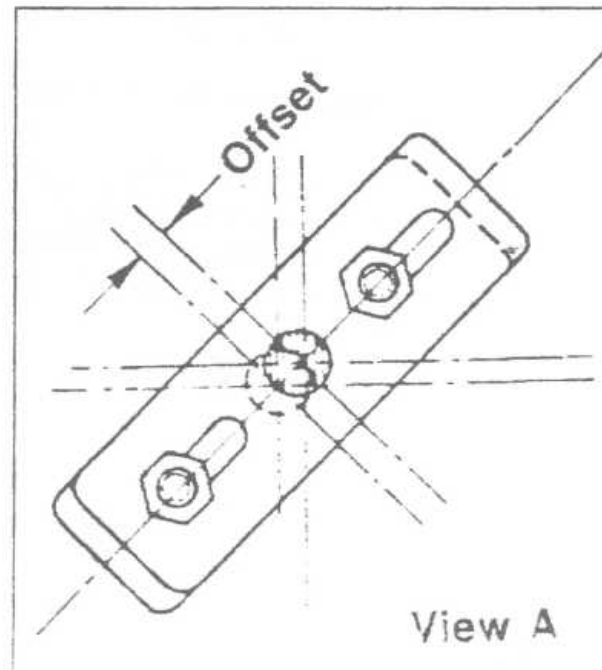


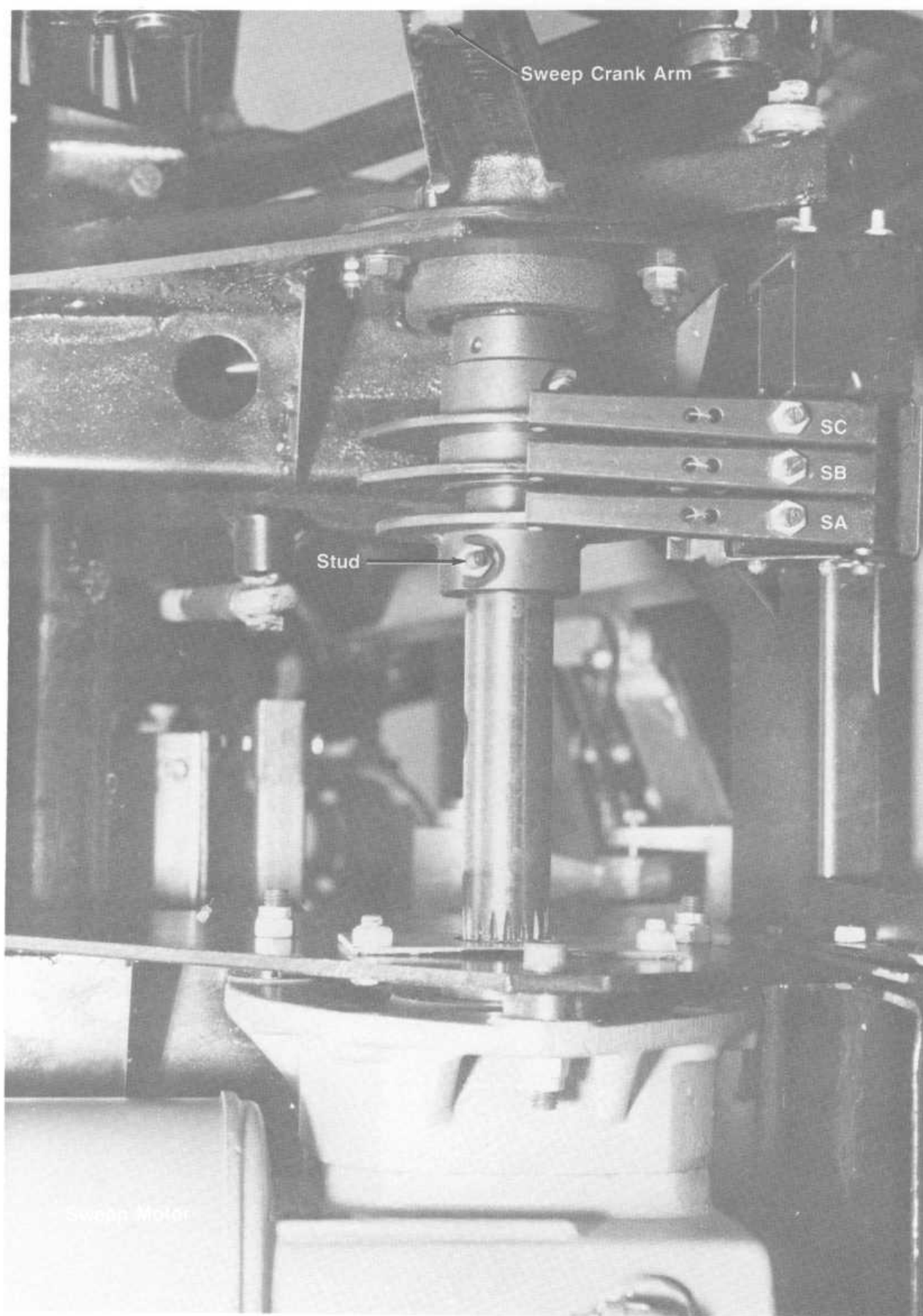
(Note 2)

Adjustable ball lift support shafts are provided to allow alignment of the ball lift to the track rails.

Adjustment is required when the shaft supports on the metal kickback assemblies are not aligned.

Alignment is achieved by turning plates on the support shaft assemblies till the plates are parallel to the direction of offset. (See view A)





SWEEP CAM LEVERS ADJUSTMENT

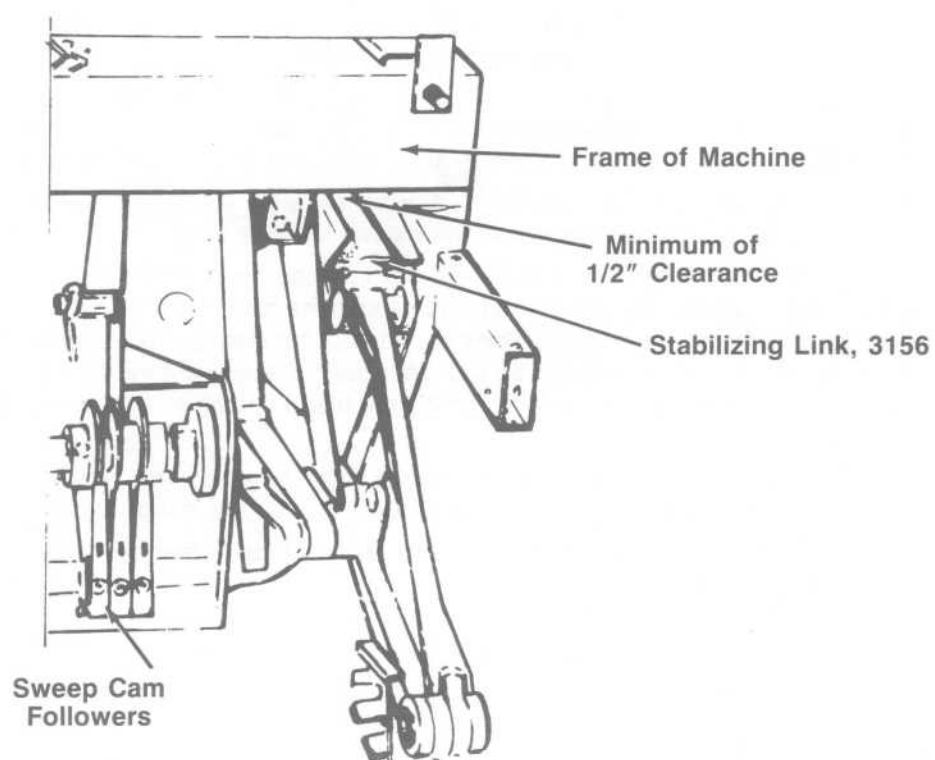
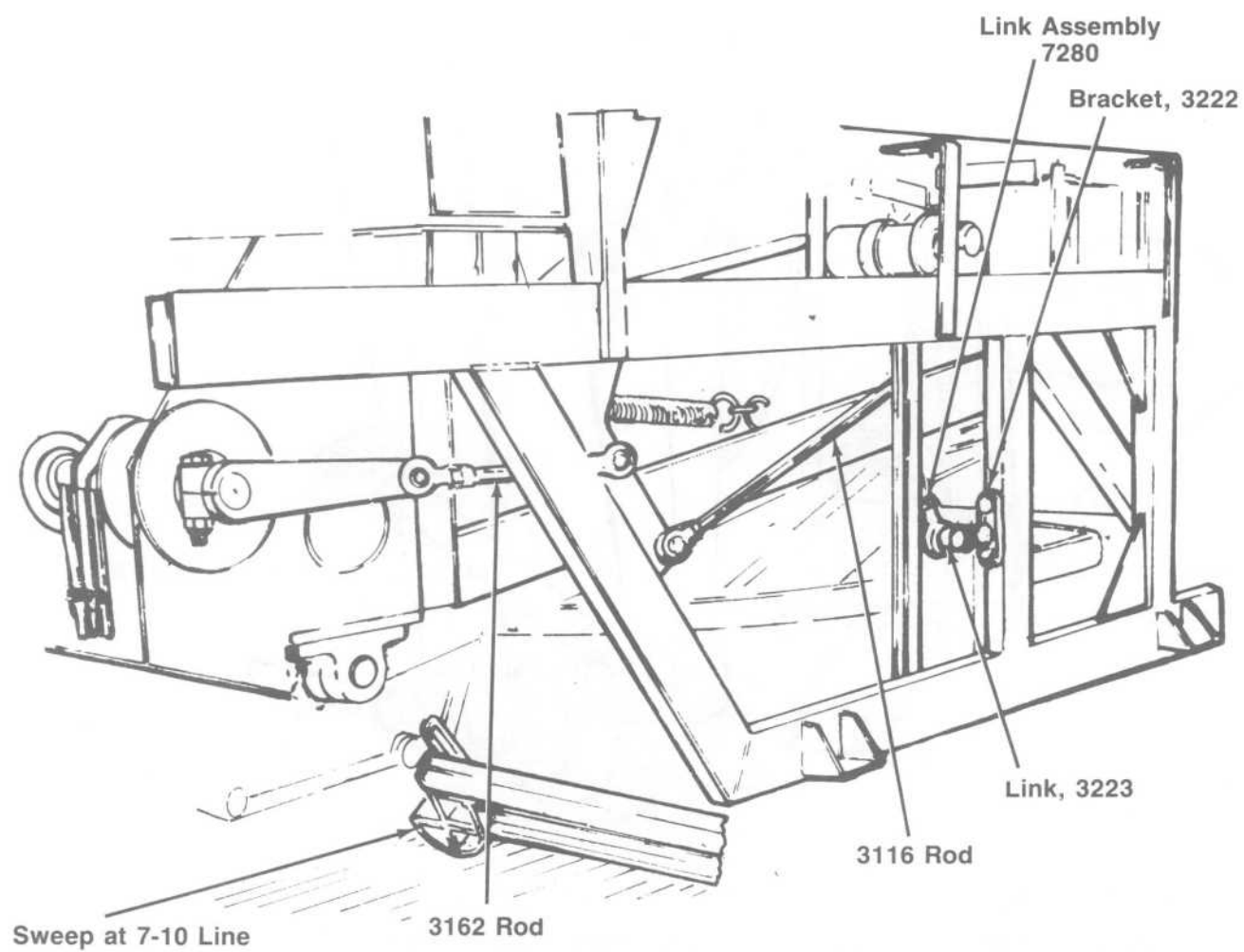
1. Crank or run sweep to put lever at lowest portion of sweep cam.
2. Insert gauge ST 2748 between lever and lowest portion of cam.
3. Small end (.136) of gauge should not actuate switch, but large end (.176) should actuate switch.
4. Loosen lock nut and adjust screw to obtain above conditions. Tighten lock nut.

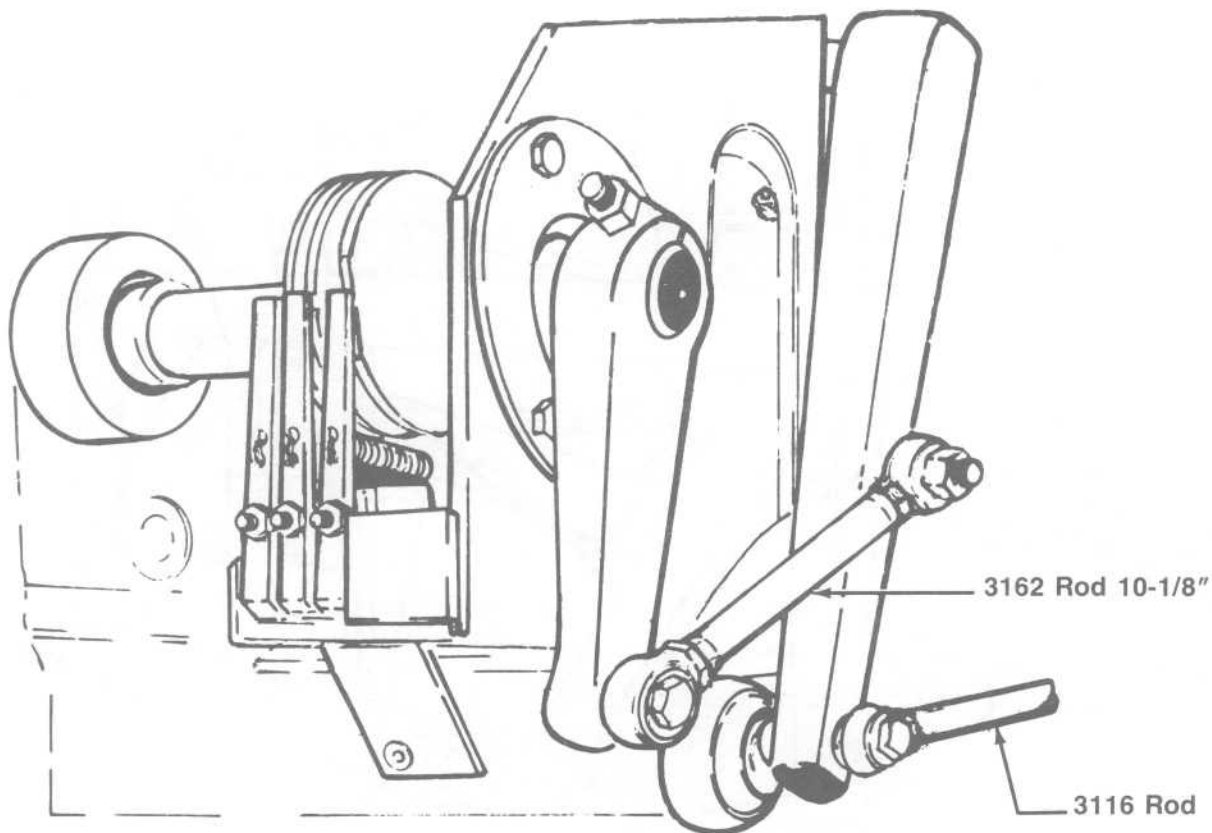
SWEEP CAM ADJUSTMENT

NOTE: After adjusting the sweep cam levers as described above, proceed as follows:

1. Crank the sweep to its highest position. (Zero)
2. Loosen the cam studs and position cams so the stud is parallel with pin deck. Tighten cam studs. This is the initial or approximate setting.
3. Run machine under power and note sweep down, sweep run, and sweep up positions. If sweep operates smoothly no further adjustment is necessary.
4. If adjustment is necessary, adjust SB cam so the sweep stops just before its bottom most position, 66 degrees. Adjust SA cam for sweep run thru so the sweep stops at 270 degrees. See note below.
5. Run machine and note operation of sweep. It may be necessary to readjust the lever of the table, sweep interlock cam SC (lever away from the cam) to obtain proper interlock operation. Correct sweep interlock is when the sweep sufficiently clears the #1 pin on run thru when the table is picking up and respotting pins.

NOTE: If sweep over runs at stopping positions, adjustment is made by turning cams in direction of rotation. If sweep stops short, turn cams in opposite direction of rotation.





SWEEP ADJUSTMENTS

1. With sweep at zero, adjust short rod #3162 to obtain 10-1/8" center to center. Tighten lock nuts. The sweep travel is determined by the length of rod #3162. If this rod is too long, the sweep will collapse into the pit; if too short, it will hit the framework of the machine at zero position.
2. Adjust rod #3116 to obtain a minimum of 1/2" clearance between the stabilizing link #3156 and the frame of the machine. See NOTE below. See photo page 5.19.
3. Crank sweep to guard position. Sweep shield should clear channel by approximately 3/4". To increase clearance between sweep shield and channel, lengthen #3223 link; to decrease clearance, shorten link. The #3223 links should be at right angles to the side frame of the machine.
4. Crank sweep to #5 pin position. The sweep bar should clear the pin deck by approximately 1/4". If not, move bracket 3222 up to lower sweep or down to raise sweep.
5. Set a pin on each side of the pin deck as far back as possible. Continue cranking the sweep to its extreme back position. The sweep should just touch the pins so that under power, the sweep should knock the pins into the pit. If the sweep does not go back far enough, increase length of connecting rod 3162. Do not lengthen to maximum position. Under power, the sweep may collapse into the pit area. (The sweep bar does not necessarily have to be parallel to the tail plank when the sweep is cranked to its extreme back position.)
6. Crank sweep to zero position. Recheck step 2 above for clearance. Rod 3116 may have to be readjusted in order to have sufficient clearance and for the sweep to hang parallel to the pin deck.
7. Operate machine under power and note sweep operation. It may be necessary to repeat the sweep cam adjustments on page 5.18.

NOTE: Adjustments described in steps 2, 3, and 4 are made on both sides of the machine.

Removal of Sweep Rocker Arm

1. Turn on machine-turn off back end motor-sweep pins into pit. Cycle machine spotting second set of pins and sweep pins into pit-stop sweep at guard. Run table to re-spot height and turn machine off.
2. Remove power plug-remove chassis and right and left cross beam covers, item 4 and 40 page 99 in parts section. Remove ball lift guard, item 4 and cover guard item 5 page 111-pull distributor carriage to fully retracted position.
3. Remove four bolts item 53, 54 and 55 from chassis weldment item 48 page 11. Remove chassis weldment. Remove right and left hand platforms (catwalks) item 23 and 24 page 11. Handrail bolts must be removed.
4. Unplug table cable from table and remove strain clamps-pull cable up out of the way.
5. Remove shuttle spring (070006447) – remove bolt from shuttle connecting rod, item 1 page 19, at bin lever, item 36 page 47, - loosen clamp stud, item 16 page 19, move shaft item 23 to right-bring the shuttle connecting rod, item 1 and the lever item 12, out the front of the machine.
6. Remove cotter pins from item 18 and 19 page 11, bin support brackets, loosen bolts, item 27, holding bin support brackets to cross beam (very loose but do not remove bolts.)
7. Install a 2" long ¼" bolt at each rear corner of bin assembly at bin support, item 14 page 47. Bolt goes through bin support and machine frame-this will keep the bin from sliding off machine frame-holes are there for shipping.
8. Front of bin assembly must be raised high enough for brackets, item 33 page 47, to clear bin supports by 3 to 4 inches. Place a 5 foot long 2 X 4 under bin assembly over machine frame to hold bin up.
9. Remove nut from special bolt, item 10 page 55, disconnect connecting rod, item 2-remove bolts, item 12, from both 3115 drive link connecting rods where they attach to rocker arm.
10. Remove bolts, item 57 page 55, from right and left pillow block bearing straps. Remove sweep rocker arm, remove bearings item 55, from rocker arm-remove special bolt item 10.

Installation of Sweep Rocker Arm

1. Install special bolt, item 10 page 55, from inside to outside in top hole (right side of rocker arm). Install rocker arm bearing and pillow block on each rocker arm.
2. Position rocker arm in machine, install and tighten pillow block bolts, item 57 page 55. Connect connecting rod, item 2 to special bolt, item 10. Reconnect both drive link rods 3115, item 13, to rocker arm with item 12. Tighten all bolts.
3. Remove 2 X 4 from under bin and lower bin until it rest in place on bin support brackets, item 18 and 19 page 11. Tighten bin support bolts, item 27 and install cotter pins in brackets. Remove both ¼" bolts installed at rear corners of bin.
4. Route table cable in place and plug it in. Install strain clamps.
5. Replace shuttle connecting rod and lever, item 1 and 12 page 19. Slide shaft, item 23, into place and tighten clamp stud, item 16. Replace bolt where bin lever attaches to connection rod and reconnect shuttle spring.
6. Replace both platforms (catwalks) tighten all bolts including handrail bolts. Install chassis frame weldment and crossbeam covers.
7. Install and connect chassis. Replace cover guard and ball lift guard. Check over all work.
8. Crank table to zero and check all sweep adjustments. Correct as necessary.
9. Install power plug, turn machine on. Turn back end motor on and check sweep operation and machine operation.

SWEEP SHAFT REMOVAL AND REPLACEMENT

(Refer to page 15 in parts section)

NOTE: Remove power and motor plugs

REMOVAL

1. Loosen clamp stud, item 15, in SA and SB-SC cams. Tap studs to free cams, crank sweep to first guard.
2. Remove bolt, item 40, from 3162 rod at end of crank arm.
3. Locate set screw in locking collar of bearing, item 20, at right end of sweep shaft, loosen set screw, locate hole in collar-use punch and hammer to rotate collar freeing it from bearing race.
4. There may also be a bearing at motor end of shaft, it will have a locking collar that must be loosened. This bearing is no longer used. A shaft plate, item 32, has been used since serial number 114698. The bearing at motor end of shaft can be removed and shaft plate 070-006-765 used in its place.
5. Sweep shaft, item 29, can now be removed by pulling to right on crank arm, item 28.
6. Loosen bolt, item 39, in crank arm. Slide arm from shaft, remove key, item 30, from shaft.

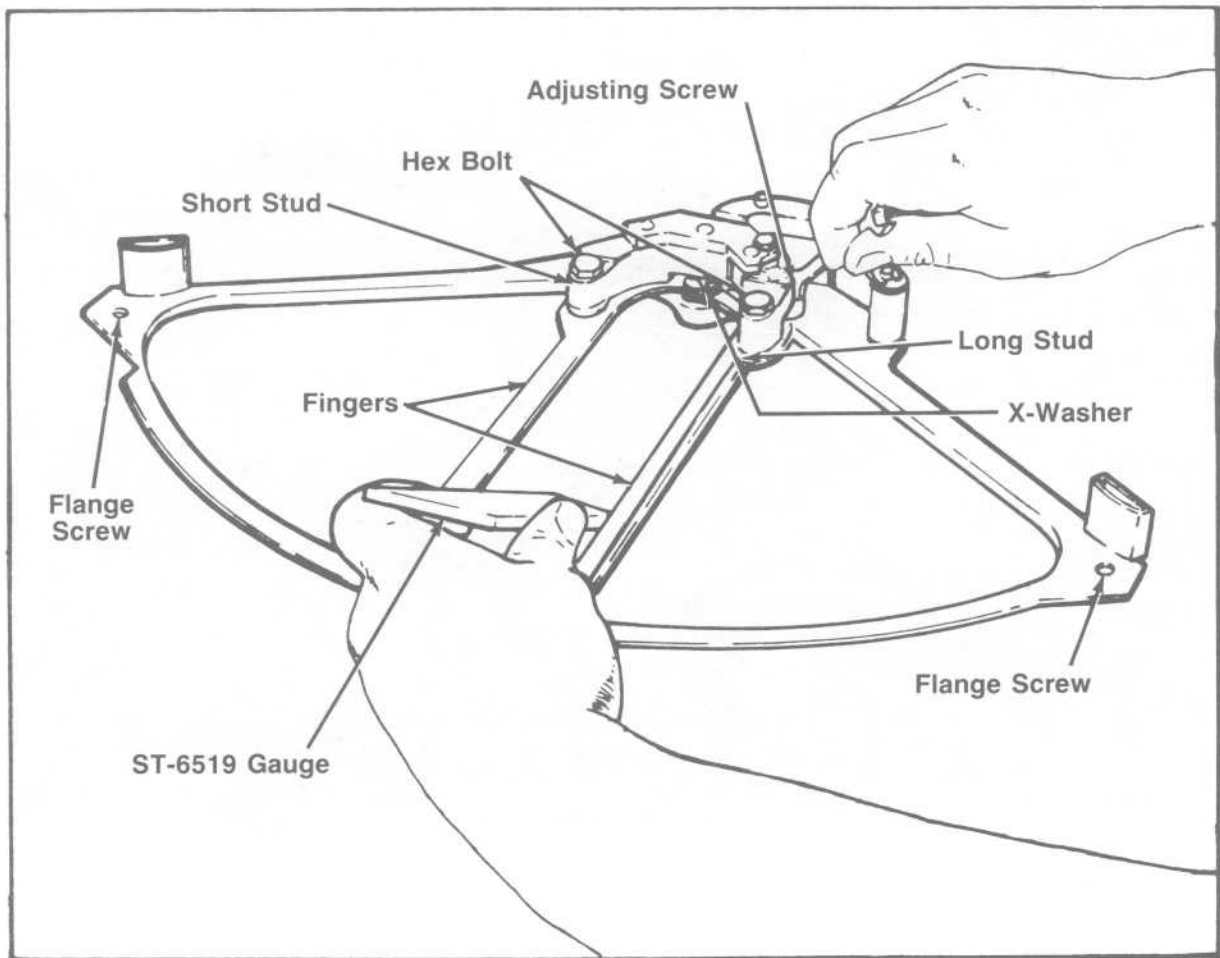
REPLACEMENT

1. Insert key, item 30, into shaft. Key must fit tight. Slide crank arm, item 28, on shaft, over key until shaft is flush with outside edge of crank arm. Tighten bolt, item 39.
2. Slide shaft through bearing, item 20, about six inches. Slide bearing collar on shaft. (Eccentric side of collar toward bearing) install SB-SC cam, item 26, on shaft, than SA, item 27.
3. Spline end of shaft should be coated with grease. Slide shaft into motor. Spline end of shaft should extend approximately $1 \frac{11}{16}$ inches to left of shaft plate.
4. Move bearing collar to right over bearing race, then rotate with punch and hammer until tight. Tighten set screw.
5. Reconnect 3162 rod to crank arm. Crank sweep through to make sure crank arm clears bearing retainer bolts and rocker shaft.
6. Adjust sweep cam levers and sweep cams per service manual page 5.18.

RESPOT CELLS AND ADJUSTMENTS OPERATION

When the table lowers to pick up pins as in first ball cycle, the fingers close on the standing pins, lock, and raise the pins high enough for the sweep to clear the lane of dead wood. The table then respots the pins. Adjustment of fingers must be 2"—see page 5.21. If the adjustment is less than this dimension, the finger assembly will not lock. If this dimension is greater than specified, the pin may slip through the fingers causing a malfunction.

The opening and closing of the cells is accomplished by means of the shifter link and pawl—see page 5.25. The shifter link is controlled by the respot tie rod and a cam attached to the table motor drive shaft.



RESPOT CELLS REMOVAL

1. The respot cell assembly may be removed from the table by removing the four flange screws, the carburetor type linkage, and the wire from the gripper switch.
2. Each finger can be replaced by removing the hex bolt and X-washer located at the pivot point. (Finger can be replaced when respot cell is mounted in the table.) When replacing fingers, the rear finger should be put over pivot point bushing first.

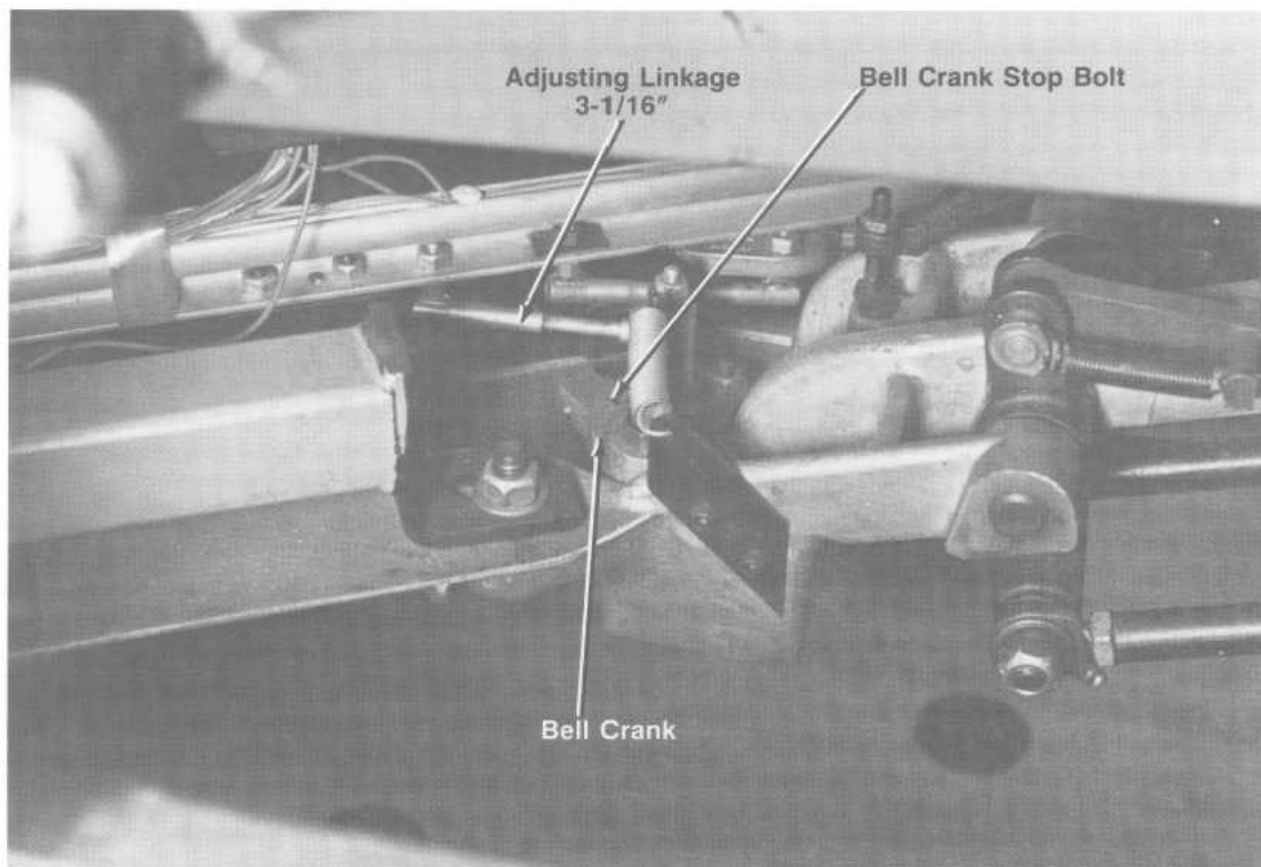
ADJUSTMENT—FOR EITHER DIE CAST FINGERS OR STEEL FINGERS

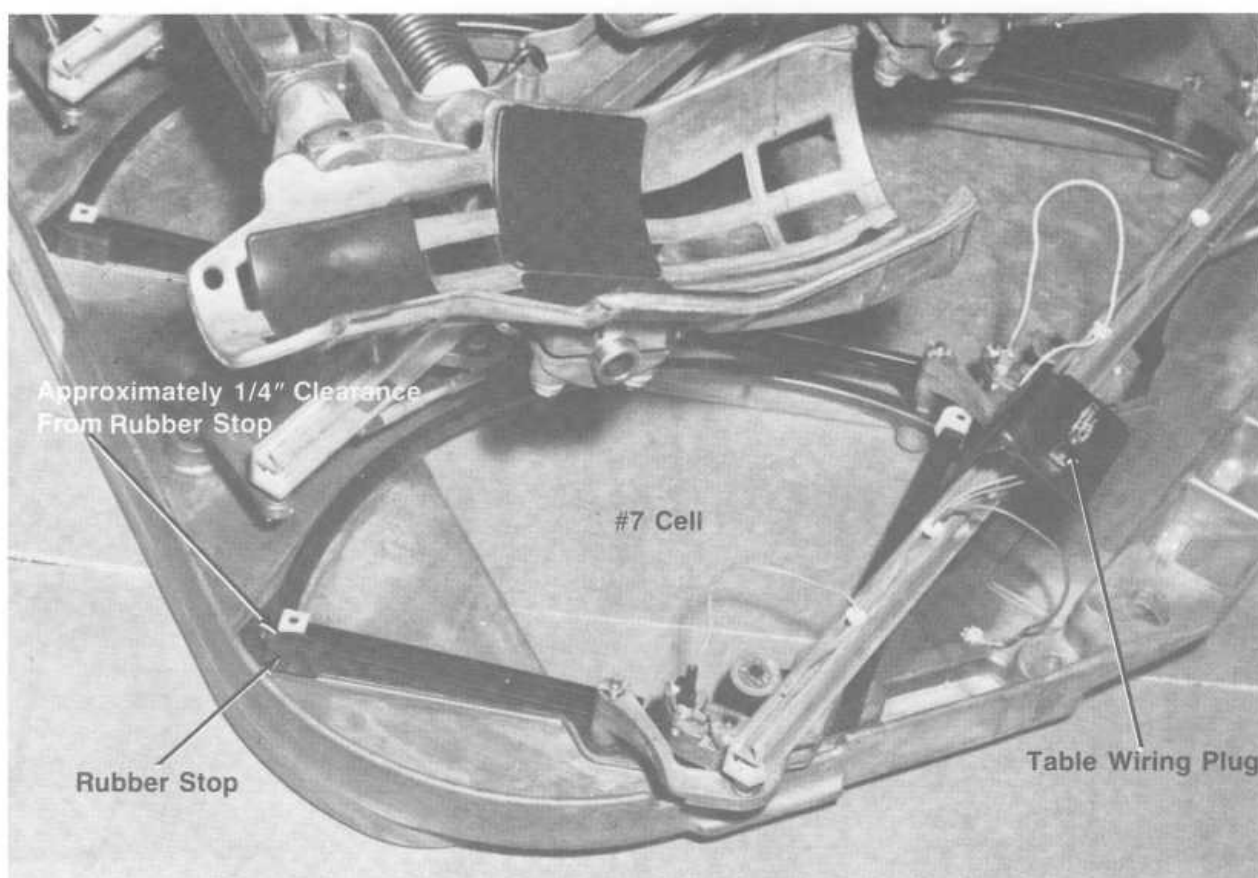
1. Move respot cell linkage to close cells as in respot condition. Using 1/4" open end wrench and ST-6519 gauge, adjust for a 2" width between fingers with spring at gripper switch compressed.

NOTE: This adjustment can be made with the respot cell in or out of the table.

RESPOT CELL BELL CRANK

To prevent binding and breakage of respot cells upon opening, a stop bolt, called the bell crank stop bolt, is provided. See picture below. This bolt takes the load from the fingers.





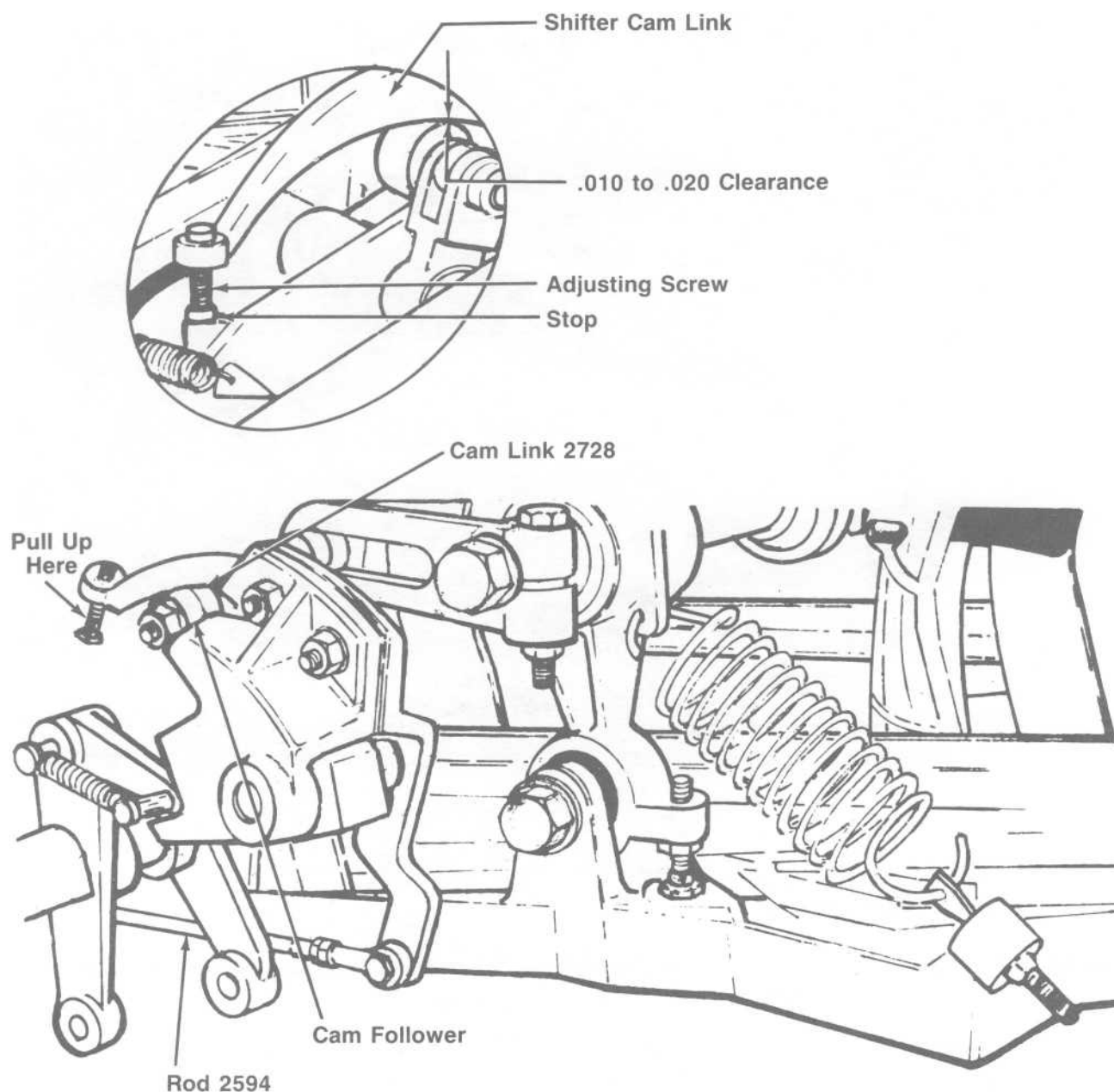
RESPOT CELL ADJUSTMENTS

NOTE—VERY IMPORTANT: The following pages of respot cell adjustments must be made in the sequence given.

1. Move respot linkage to close cells. Disconnect carburetor type linkage to all cells (number 7 cell is fixed). Make adjustment for 2" as described on page 5.21. Do not reconnect yet.
2. Adjust carburetor type drive linkage at bell crank to 3-1/16". See Note below.
3. Open #7 cell and adjust bell crank stop to obtain approximately 1/4" clearance from the rear finger to the rubber stop while holding the front finger against the stop.
4. Adjust and reconnect the connecting linkage of the remaining nine cells, one at a time, to obtain approximately 1/4" clearance from the rear finger to the rubber stop. Shifter cam link should be pulled up and held (as indicated in photo on page 5.24) while making and checking this adjustment. Open and close the respot cells after each cell is adjusted to see if adjustment holds.

NOTE: If there is a fixed drive link at the bell crank, there will be an adjustable link at the #7 cell. Adjust to 6-7/16".

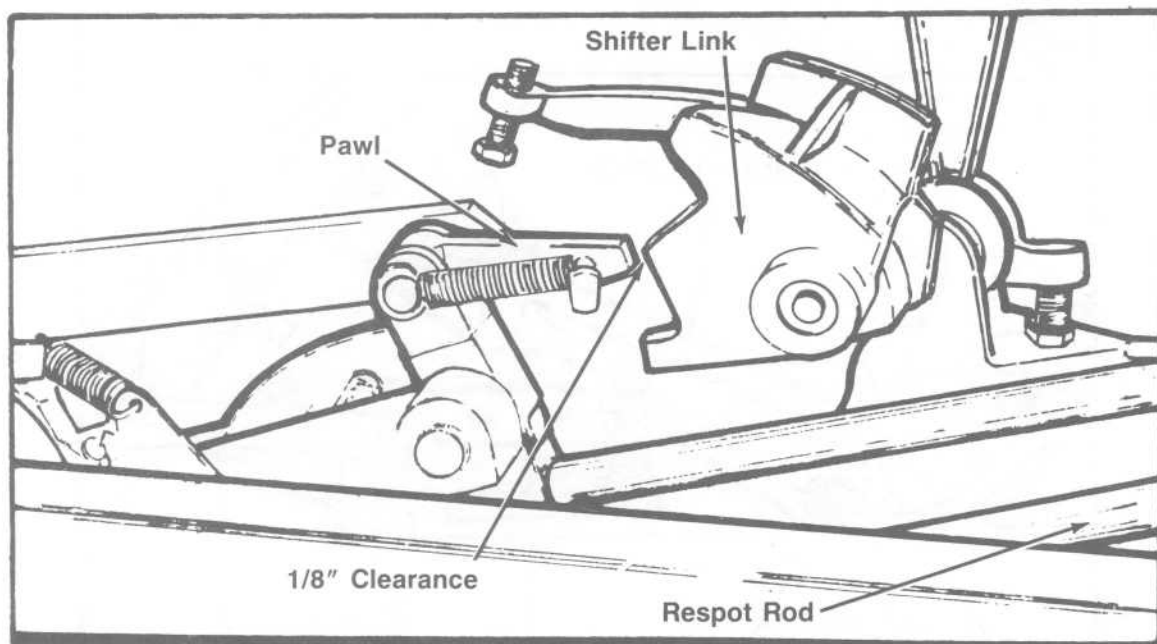
CONTINUE ON TO NEXT PAGE



RESPOT CELL ADJUSTMENTS—Continued

5. Slowly crank table into spotting action while checking clearance between the cam follower and the surface of the #2728 cam link. (If the clearance is such that the cam follower is difficult to turn, shorten #2594 control rod before cranking table any further down. Failure to do so will cause #2594 rod to bend as table is cranked down.) Stop table at 180° position.
6. Adjust #2594 control rod assembly so there is .010" to .020" clearance between the cam follower and the surface of the #2728 cam link. Pull up at end of cam link (see above picture) when checking clearance.
7. Crank table to 355° position. Close respot cells and adjust stop screw on end of shifter cam link to just clear the stop. From this point, **lengthen** screw stop about 4 turns to prevent force from being applied to the respot cell fingers, yet to allow respot cells to lock on pins.

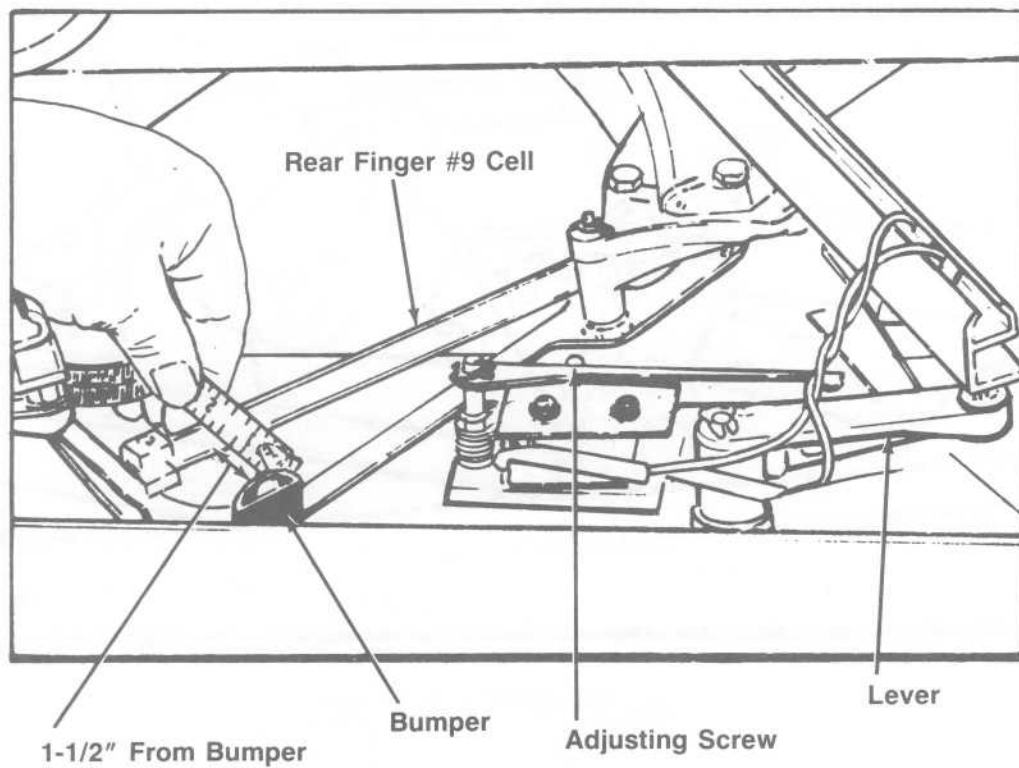
CONTINUE ON TO NEXT PAGE



RESPOT CELL ADJUSTMENTS—Continued

8. Close respot cells slightly so that the center high point of shifter cam link, Part #2724, is directly opposite the pawl, Part #2590. (See photo above.) Adjust the respot rod so that the pawl clears the center high point of the shifter cam link by 1/8".
9. Run table through several respot operations. Fingers should open and close smoothly and without binds. Recheck previous steps if necessary. If fingers do not lock on pins, a tight cell is indicated. Inspect all cells and adjust accordingly. See note below.
10. Check respot cell protection switch adjustment. See page 5.26.

NOTE: To avoid damage to the fingers on initial running of table, use only one pin until smooth operation is achieved; then test with complete set of pins.

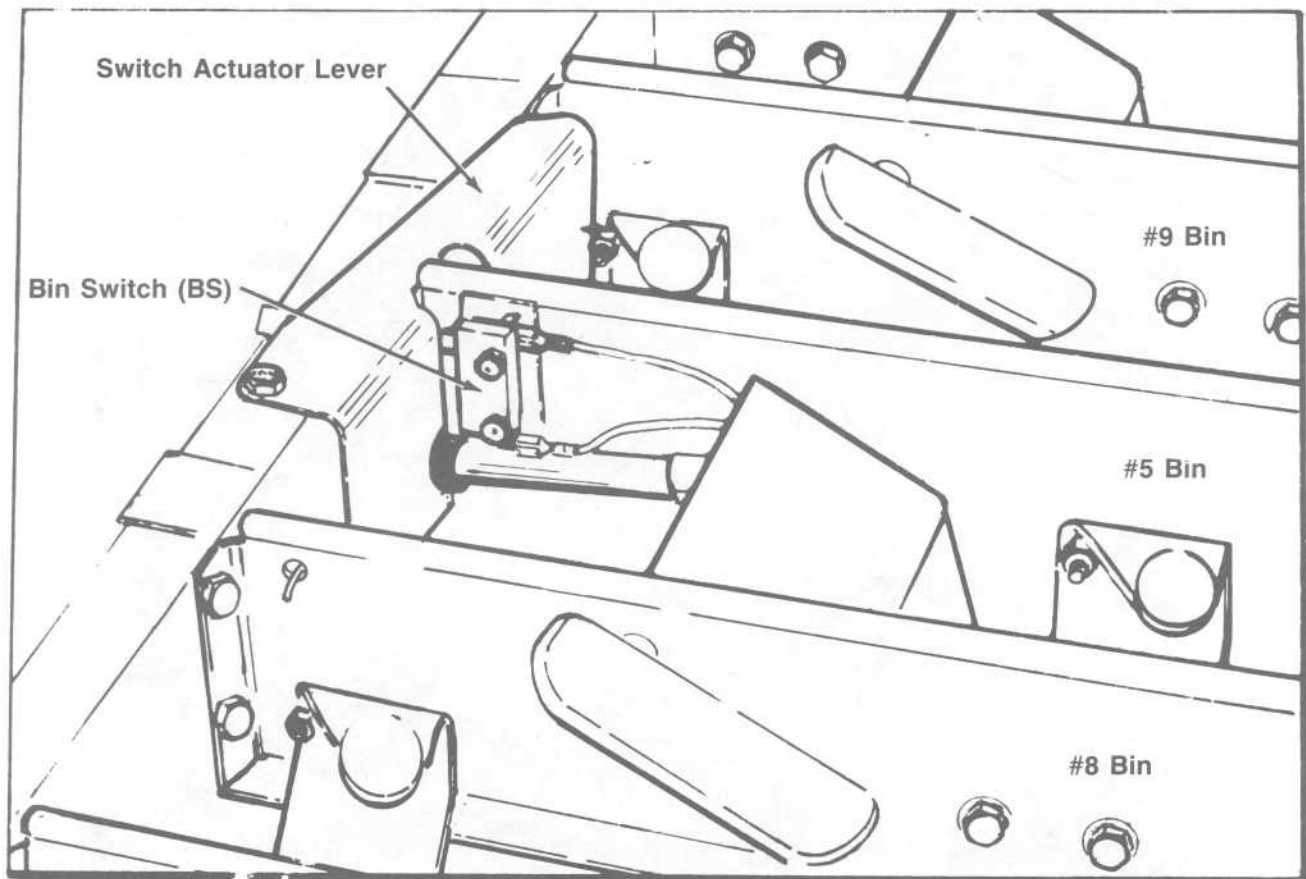


RESPOT CELL PROTECTION SWITCH

NOTE: The respot cell protection switch prevents the table from operating (feeling for pins) when the cells are not fully open.

ADJUSTMENT

1. With respot cells in open position, hold front finger of #9 cell to extreme forward position.
2. Move rear respot cell finger forward to a maximum of 1½" from the 2752 bumper. **Use cell linkage for movement. DO NOT PUSH FINGER.**
3. Loosen lock nut on switch lever and adjust screw until switch operates. Tighten lock nut.

**BIN SWITCH**

The bin switch (BS) is located in the bin framework between the #8 and #9 bin locations. When the 10th pin #9 is delivered to the bin assembly, it actuates the (BS) switch which sends a signal to the chassis indicating that 10 pins are ready for a spotting cycle. To test the switch, operate the lever several times. If the switch does not actuate, reposition the switch accordingly.

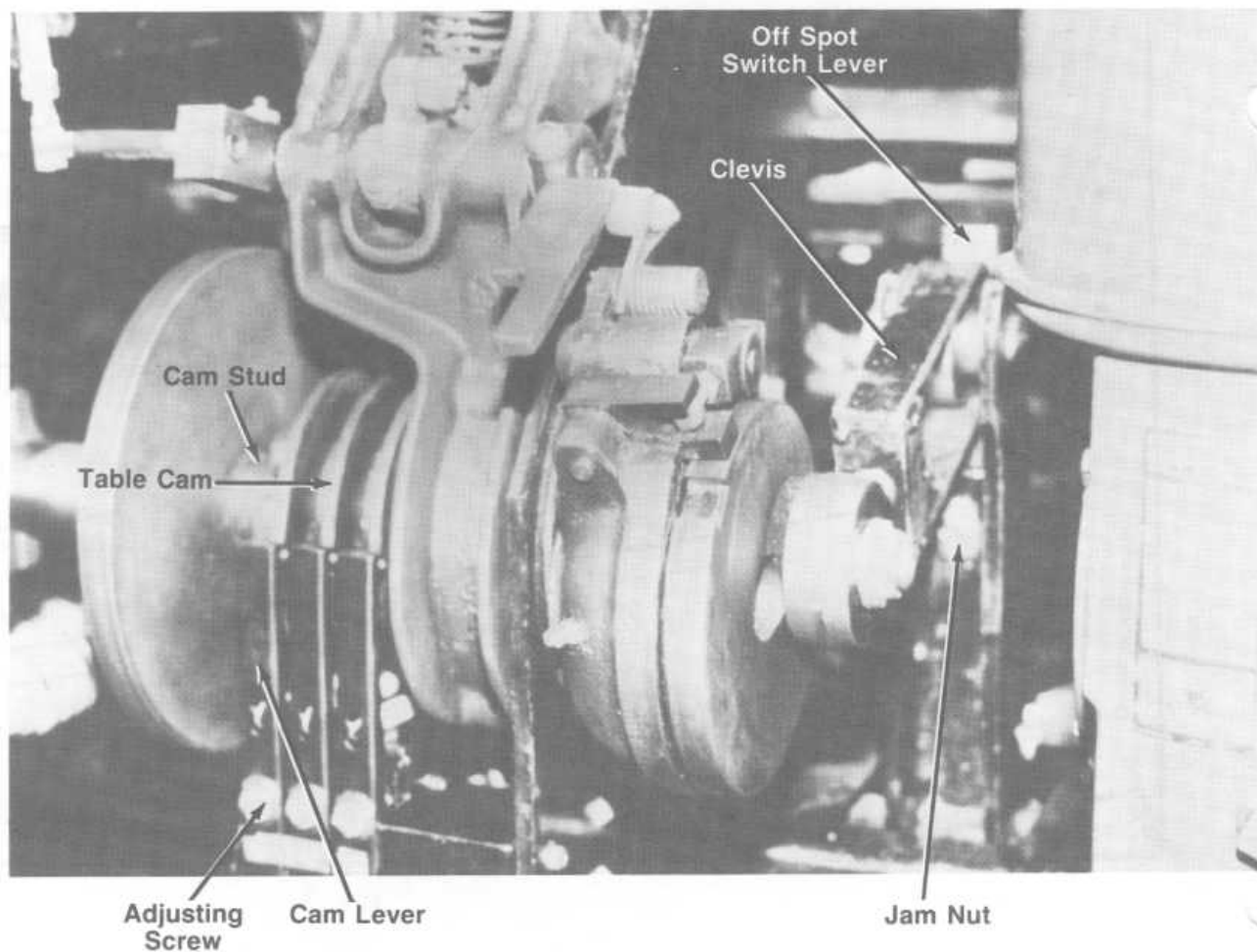


TABLE OFF-SPOT SWITCH OPERATION

If the table contacts an off-spot pin during a respot cycle, the clevis moves the off-spot switch lever which in turn closes the off-spot switch. This action converts the machine into 2nd ball cycle logic. All that is required then is to remove the dead wood, if any, open the respot cell fingers, and operate first the sweep reverse, then sweep run switch to bring the sweep to zero position.

ADJUSTMENT

1. Loosen adjusting screw jam nut.
2. Using gauge ST-2748, insert .176" end of gauge between lever and clevis and adjust screw for switch operation. When .136" end of gauge is inserted, switch should not actuate.
3. Hold screw and tighten jam nut.
4. To check above adjustment, cycle machine through 1st ball with a pin placed out of respot cell range. Sweep should drop to 66° guard position, table should contact pin and return to zero position, the 1st ball light should go off, and the 2nd ball light should come on.
5. Open the respot cell fingers and operate first the sweep reverse, then sweep run switch to bring the sweep to zero position.

TABLE LEVERS AND CAMS OPERATION

The table is controlled by cams, levers, and switches. The TA1 normally closed contact (N.C.) runs the table from 185° to 355°. The TA2 turns on the indicator lights and initiates the sweep run-through. TB, along with SC, are the interlock cams.

TABLE CAM LEVERS

NOTE: Some of the adjustments of the table require that the table be operated under power. When this is the case, the respot cells should be actuated manually to open grippers to prevent damage to the fingers.

ADJUSTMENT

1. Crank or run table to put switch cam lever at lowest portion of table cam.
2. Insert gauge ST-2748 between lever and lowest portion of cam.
3. Small end (.136") of gauge should not actuate switch, but large end (.176") should actuate switch.
4. Loosen switch lever jam nut and adjust screw to obtain above setting.
5. For proper operation, the levers must ride fully on the table cams.

TABLE CAM ADJUSTMENT

NOTE: The table cam switch levers must first be adjusted as described above.

1. Crank the table to its highest position.
2. Loosen cam stud and position cams so that the stud is parallel with the pin deck. (This is the approximate or starting cam setting position.) Tighten stud.
3. Run table under power and note the table stopping position at the end of a second ball cycle. Table should stop just before the zero position (355°). If it does not, move the table cam accordingly. If the table overruns, move the cam in the direction of rotation. If it runs short, move it in the opposite direction.

NOTE: "Table Zero" is the point at which the table has reached its highest operating position.

TABLE DRIVE ECCENTRIC OPERATION

The height of the table travel during spotting and respotting is controlled by the table drive eccentric. During a respot cycle, the eccentric latch is engaged in the eccentric and the table lowers to respot height. When the spotting solenoid is energized as in a spotting cycle, the latch is disengaged allowing the eccentric to operate. This permits the table to descend to the deck and spot a set of pins. The driving motion of the table is transmitted to the table torque weldment (which lowers the table) through the clevis and drive assembly.

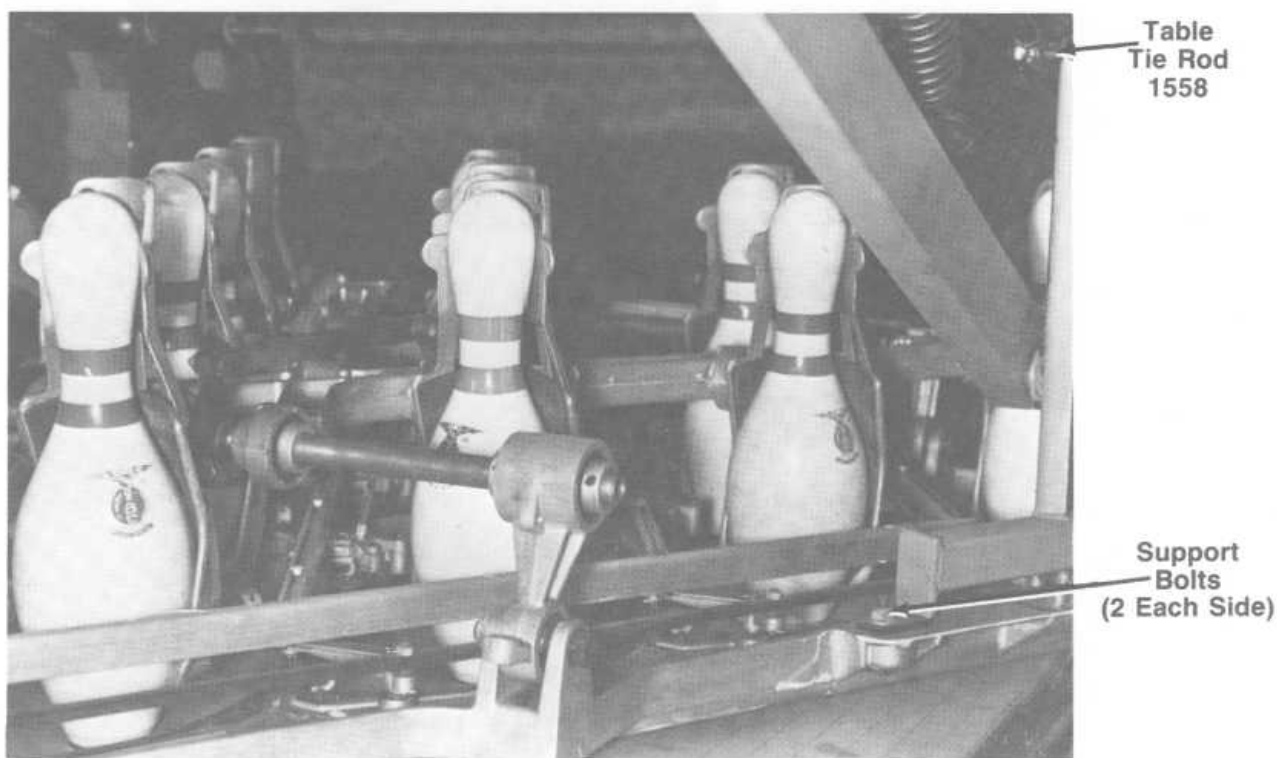
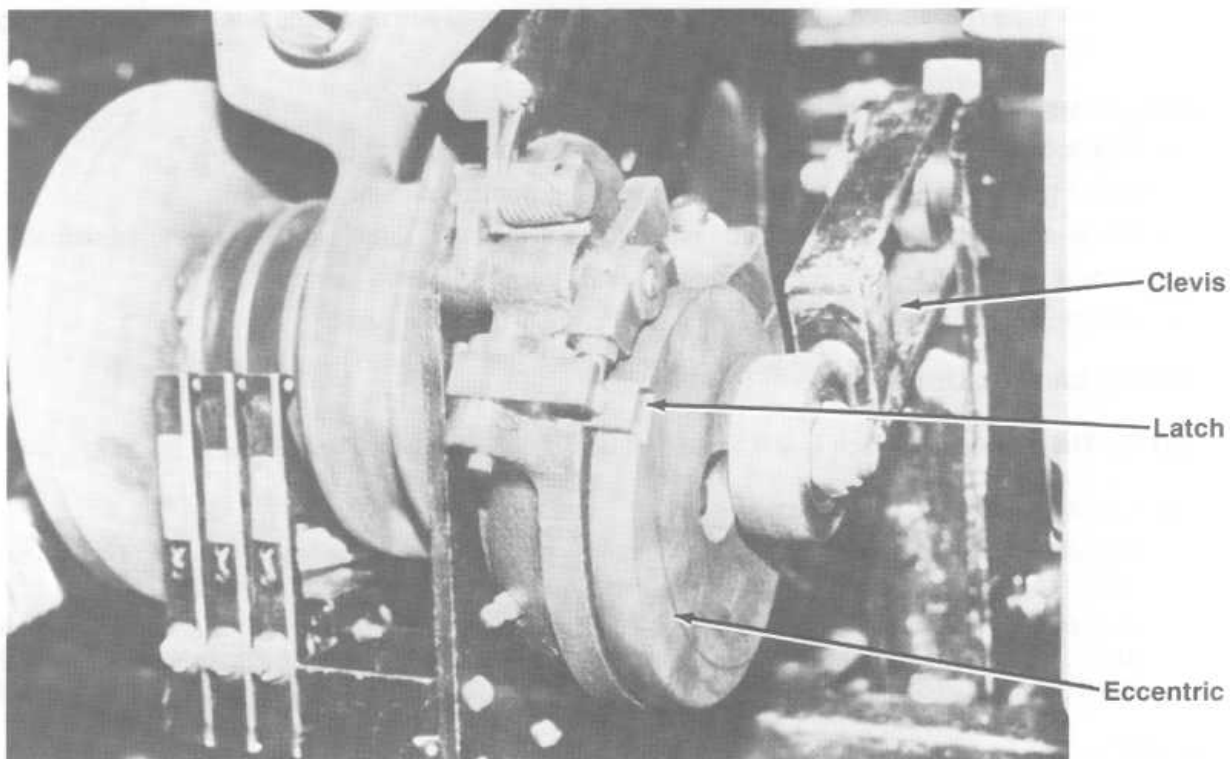


TABLE SHAFT REMOVAL AND REPLACEMENT
(Refer to page 15 in parts section)

REMOVAL

1. Turn off pin elevator switch, sweep pins into pit. Cycle pinspotter to place second set of pins on deck. Sweep pins into pin then stop sweep at guard and remove power plug, motor plug and pit light. (Cover lane with cardboard or old carpet)
2. Disconnect spot rod from lever, item 10. (Be careful of spring tension) disconnect respot rod from lever. Loosen bolts in shuttle cam, item 12 loosen nut on table cam stud, item 15, and tap free cam assembly.
3. Crank table to 180 degrees in spotting action-support table on block of wood.
4. Remove shuttle spring.
5. Remove bolt, item 39, and bearing, item 22 from clevis.
6. Loosen clamp bolt through table drive assembly, item 21, slide assembly to right off shaft, item 7. Remove key, item 30 from shaft.
7. Remove spring, item 31 from spot and respot levers. (See page 5.39) tie levers up out of the way.
8. Move shuttle cam, item 12 to left then remove key from under cam.
9. Remove bolts, item #42 from cam switch assembly, item 13. Move Table cam assembly, item #14 to left with shuttle cam.
10. Locate and loosen set screw in bearing collar, item 20 at right end of shaft. (From bottom-up behind solenoid housing) locate hole in collar-use punch and hammer to rotate collar to free it from bearing race.
11. Move shaft, item 7 to right until left end is free of motor and shaft plate, item 32. Bring left end of shaft forward out of machine. The respot, spot, shuttle and table cams comes out with the shaft. (Note: if the machine has a bearing at the motor end of the table shaft, it may be necessary to remove the table motor and inboard bearing to gain clearance to free the shaft. This bearing is no longer used and may be replaced with shaft plate 070-006-765).
12. Measure distance from end of shaft to spot and respot cams, item 8 so cams can be accurately positioned on new shaft.

REPLACEMENT

1. Install key, item 30 in shaft, item 7 and position spot and respot cams, item 8 on shaft. Slide shuttle cam, item 12, table cams, item 14, and bearing lock collar on shaft. Coat spline end of shaft with grease.
2. Inspect bearing, item 20, then slide right end of shaft through bearing until left end of shaft can be installed through shaft plate into motor.
3. Slide shaft into motor until spot and respot cams line up with cam followers on spot and respot levers. Reconnect spot and respot lever springs. (5.39).
4. Move bearing lock collar over bearing and tighten with punch and hammer. Tighten set screw.
5. Install shuttle cam key and move shuttle cam into position. (Tighten bolts after table is at zero).
6. Install table drive assembly key and table drive assembly. Tighten clamp bolt. (Caution: do not push table drive assembly on shaft so far that it will strike bolts attaching bearing retainer, item 19).
7. Install bearing, item 22 and bolt, item 39, in over travel clevis, install shuttle spring then crank table to zero.
8. Reconnect spot and respot levers.
9. Reinstall cam switch assemble bolts. Position table cam behind cam levers. Adjust levers and cams. (5.29).
10. Install pit light, crank sweep to zero. Connect power to machine and check operation.

TABLE TORQUE TUBE ASSEMBLY REPLACEMENT

(Refer to pages 21, 39 & 43 in parts section)

NOTE: Remove Power Plug and Motor Plugs.

REPLACEMENT

1. Store all pins in pit area. Obtain two 2 x 4's about 4 feet. Place on pin deck, one across the 7-10 line and the other over the 2 & 3 pin spots.
2. Disconnect the spot and respot rods, item 1 & 2 page 43, from levers. (be careful of spring tension).
3. Crank table to top dead center and disconnect counter balance springs, item 21 page 39, from weldment.
4. Crank table into spotting position. Stop at bottom dead center with table resting on 2 x 4's.
5. Remove bolt; item 34 page 21, from yoke weldment assembly. Disconnect off spot switch wires from switch, item 6 page 39, and remove cable clamp. If the table cable is attached to the torque tube weldment, remove cable clamps.
6. Remove bolts (early machines may have pins) item 26 page 39, that pass through the weldment and bushings on table supports. Watch for spacers item 15 & 16 page 39, between weldment and bushings.
7. While supporting the torque tube weldment (it can be secured to the box beam with mechanics wire) remove bolts from pillow block bearings, item 22 page 39, remove torque tube from machine.
8. Remove the off spot lever, spring, pin and adjusting screw, items 2, 3, 4 & 5 page 39, from the torque tube.
9. Install off spot lever, spring, pin and adjusting screw on replacement torque tube. Install bearings on torque tube. Position torque tube in machine (it can be held in place with mechanics wire) and bolt pillow block bearings to cross beam weldment.
10. Install bolts, item 26 page 39, through torque tube and table support bushings with spacers, item 15 & 16 page 39, in position.
11. Fasten table cable to torque tube. Attach off spot wires to switch and fasten cable clamp in position.
12. Install bolt, item 34 page 21, through torque tube and yoke assembly.
13. Crank table up to top dead center and reconnect the spot, respot rod and counter balance springs.
14. Adjust off spot switch (service manual page 5.28).
15. Proceed with table adjustments (service manual page 5.31).

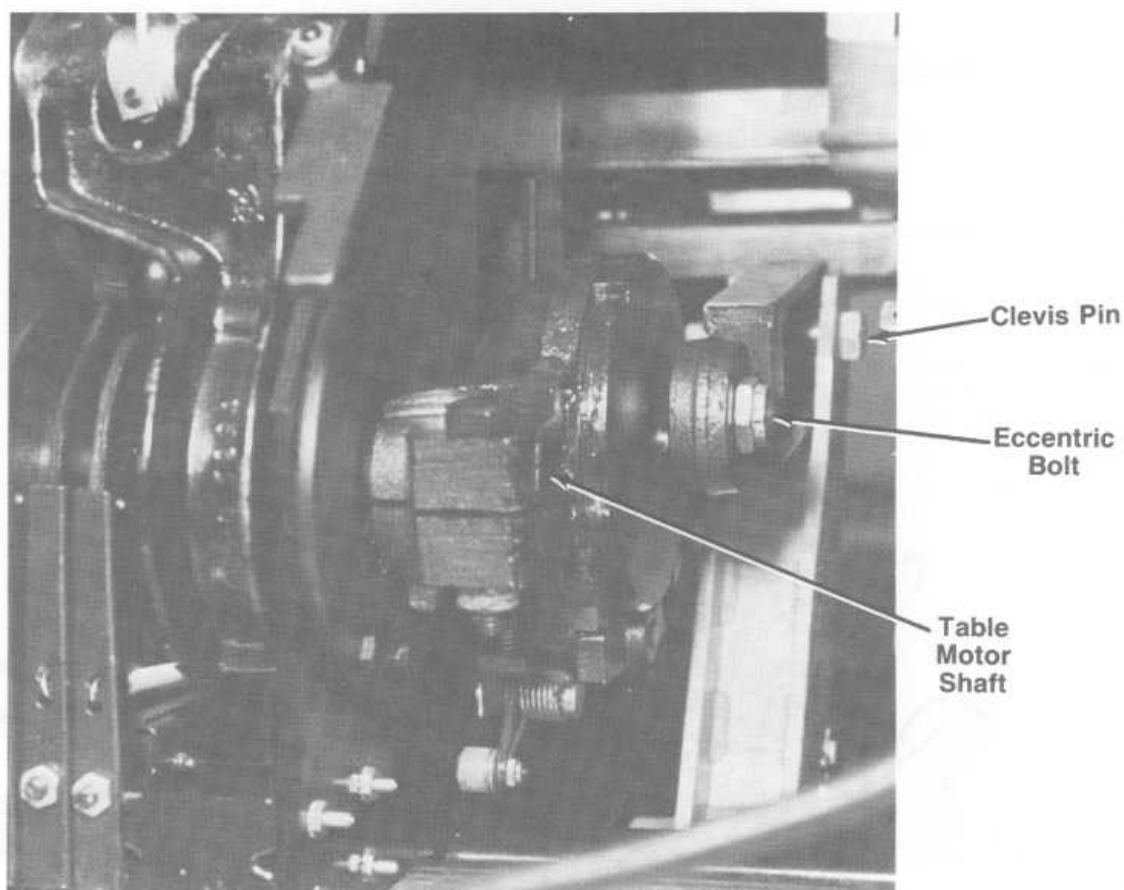


TABLE ADJUSTMENTS

To Correct Pins Wobbling or Falling During Spotting

NOTE: Adjustments **must** be made in the order given.

1. Crank the table in normal direction of rotation (the cams will be turning toward you) so that the table will go into a spotting position. Stop when the bolt in the table drive eccentric, the clevis pin, and the table motor drive shaft are in line. (This is bottom dead center of table rotation.)
2. Adjust the table height for $5/16$ " clearance between bottom of table and the pin deck by lengthening or shortening the clevis. (1/2 turn of the clevis causes approximately $1/8$ " of table movement.) Shortening the clevis raises the table, lengthening the clevis lowers the table. Use ST-6519 gauge or $5/16$ " allen wrench as gauge. The clearance between the table and pin deck should not exceed $3/8$ " or be less than $1/4$ ".
3. Place a block of wood in between the table and pin deck in order to remove the clevis bolt.

NOTE: Table cross level may be corrected by using slotted washers as required between table and support post.

When front to rear level is not correct, change length of tie rods 1558. These two rods must be turned uniformly. Lengthening the rods raises the front of the table **AND** lowers rear of table. Shortening the rods does the opposite. See page 5.30.

All levels are taken with respect to the pin deck.

CONTINUE WITH TABLE ADJUSTMENTS ON NEXT PAGE.

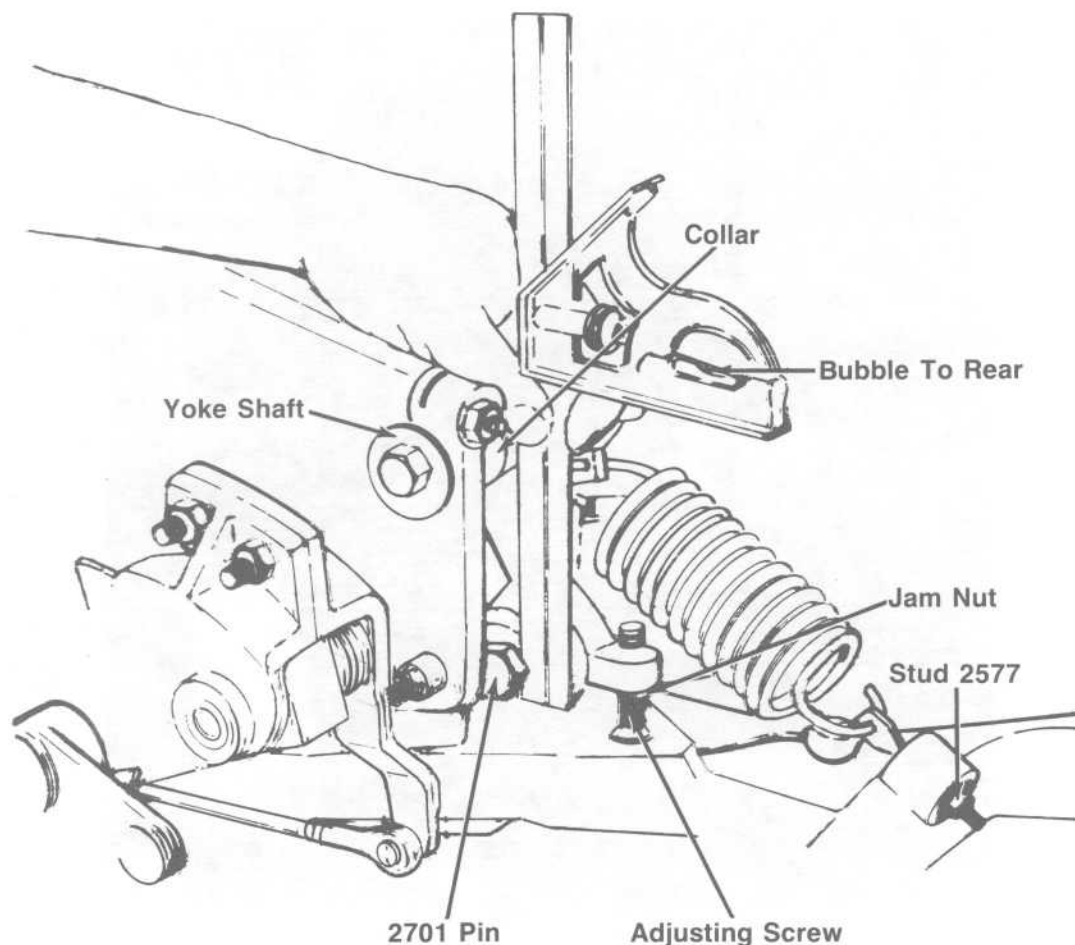


TABLE ADJUSTMENTS—Continued

4. Crank table motor in opposite direction of rotation (table cams will be turning away from you) until the table is approximately 6" off the pin deck. (This is about the 130° position.)
5. Loosen the collar on the front yoke shaft and slide collar away from yoke.
6. Using a combination level and square, hold square against front yoke shaft and #2701 pin. Loosen jam nut and adjust screw stop until combination square reads 1/2 bubble (with bubble toward rear of the machine).
7. Tighten jam nut and reposition and tighten collar.
8. The nut on stud #2577 is to be tightened all the way down to provide maximum spring tension. Continue with adjustment 9 on page 5.33.

NOTE: This adjustment is to provide the correct amount of toe-in required for good spotting action. The cup assembly is positioned for spotting by means of the large spring attached to the yoke. Too little toe-in will cause the pins to be spotted flat on the deck; too much toe-in could cause pins to fall over.

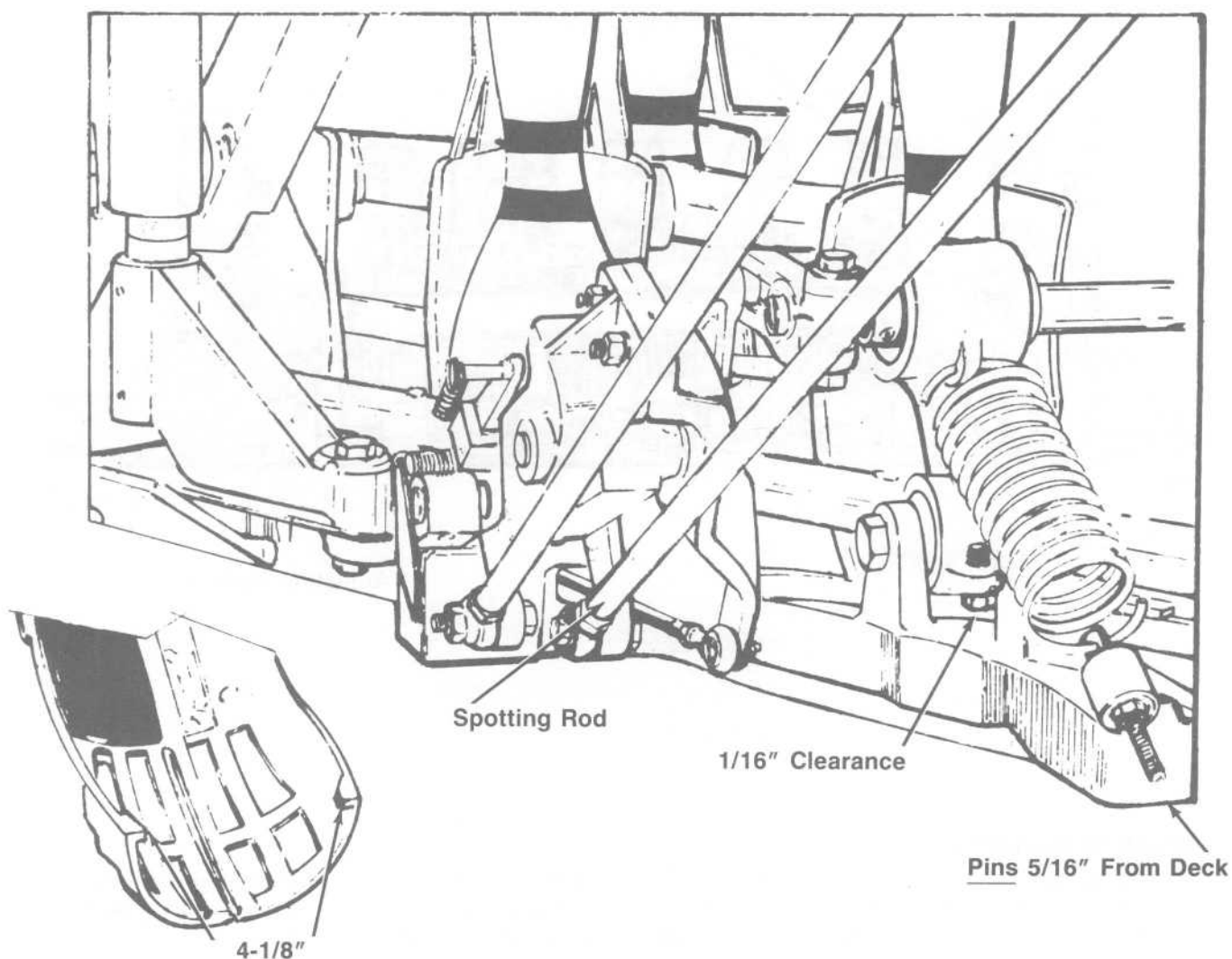
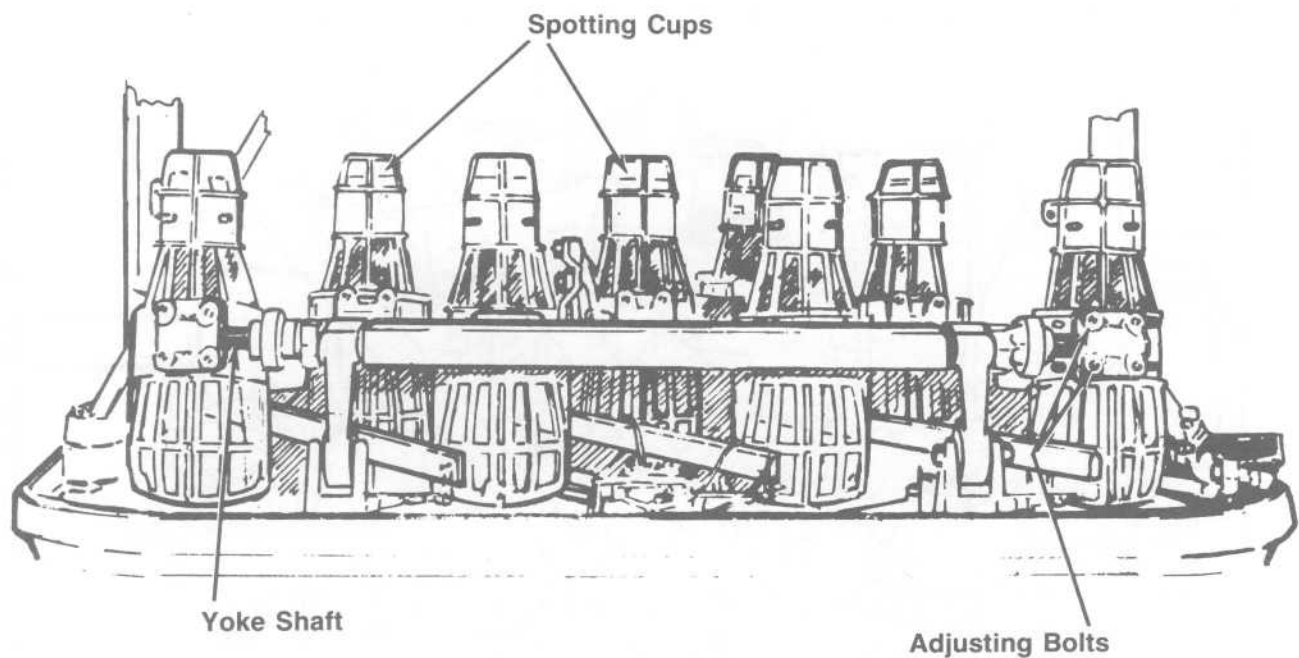


TABLE ADJUSTMENTS—Continued

9. Check the inside measurement at the forward tip of the spotting cups. The dimension should be 4-1/8". Adjust cup bolt accordingly.
10. Crank table motor in direction of rotation so that the pin bottoms are 5/16" from pin deck and are perpendicular to the deck. Adjust spotting rod until 1/16" clearance is obtained between the screw stop and adjusting screw. (This starts the yoke assembly to move away from the pins as they come in contact with the pin deck.)

NOTE: The table spotting rod transmits the motion from the spotting cam to the clevis. This permits the table spotting cups to travel in their arc down to the deck to spot pins. As the low portion of the table spotting cam is reached, the spot rod moves the yoke and cup assembly away from the pins, spotting them on the deck.

Continue with adjustment 11 on page 5.34.

**TABLE ADJUSTMENTS—Continued**

11. Adjust spotting cups to place pins on spot. If pins are too far forward, loosen the two top cup bolts and tighten the two lower bolts. If pins are too far back, loosen the two bottom cup bolts and tighten the two top bolts. If pin is to the left or right, loosen through bolts and slide cup on shaft.

CAUTION: The extreme adjustment of the cup must permit free movement of the cup.

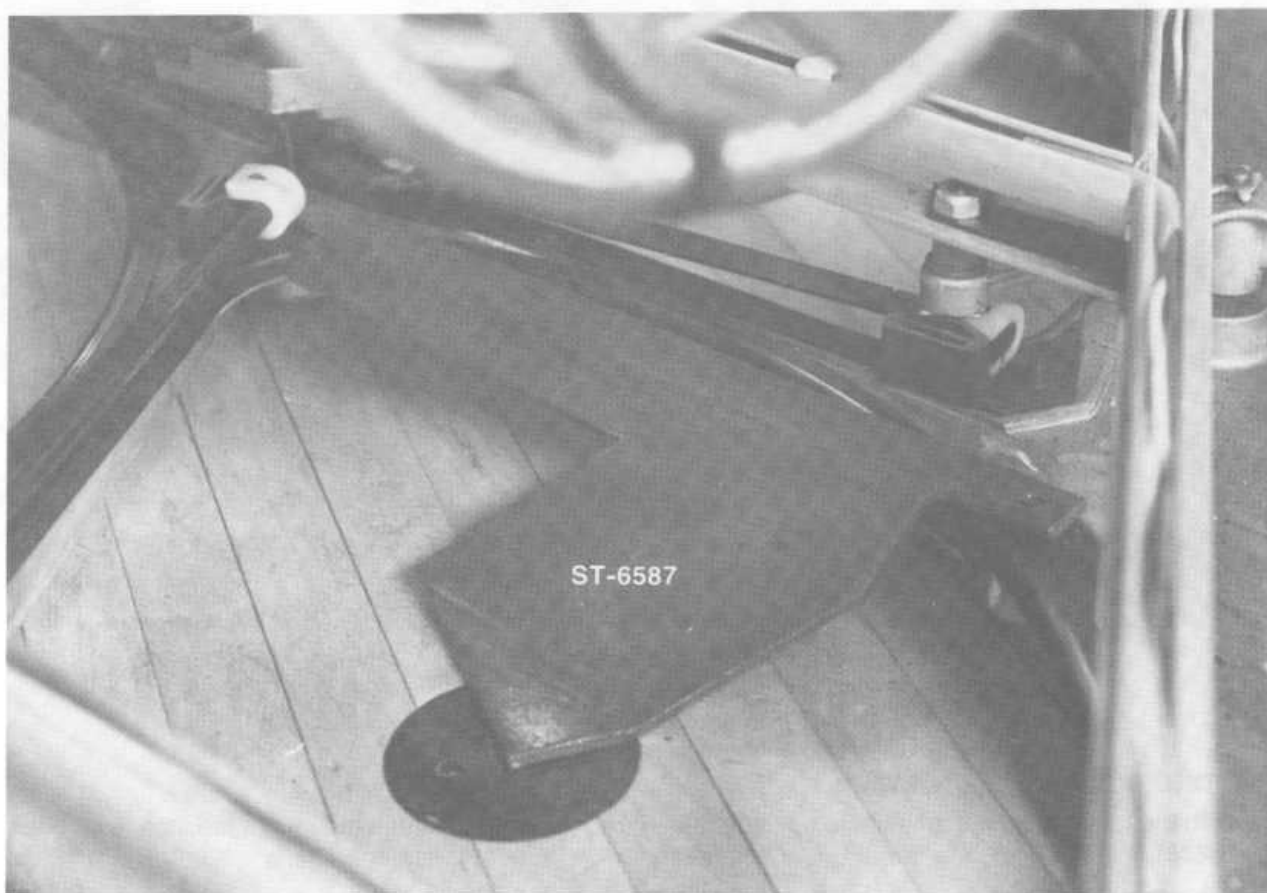
NOTE: If there is insufficient lateral movement to place pins on spot, the table should be repositioned. See page 5.35.

12. Run table and check for proper spotting of pins.

TABLE REPOSITIONING

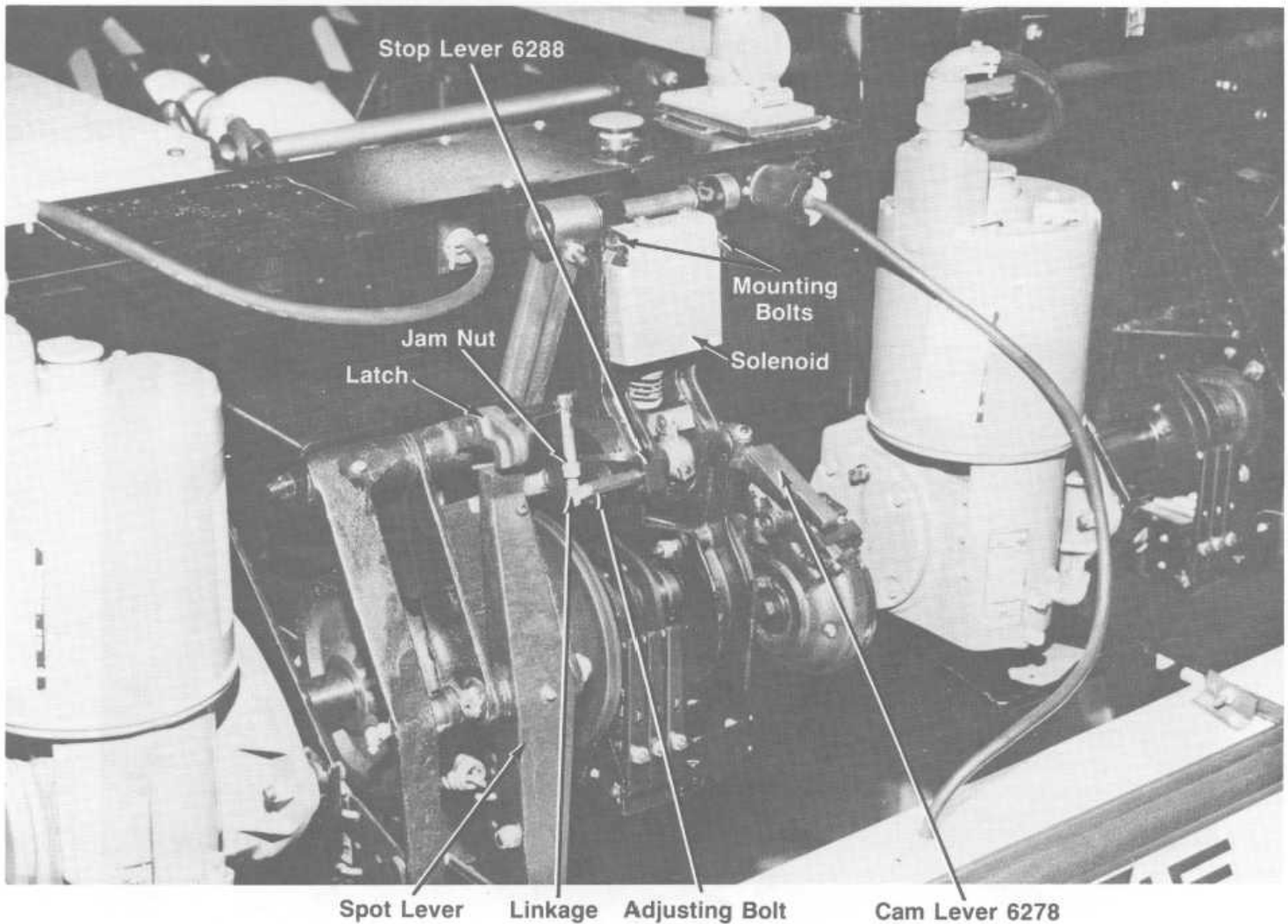
If the table must be repositioned, follow the steps listed below:

1. Crank table to mechanical zero position.
2. Remove both table counter-balance springs (Part #000 002 782).
3. Remove spot and respot rods. Crank table down to lowest point.
4. Place three 5/16" flat plates between table and deck.
5. Remove clevis pin following same procedure as indicated on page 5.31.
6. Mount Locating Tools 82-70-ST-6587 in the 1, 7, 10 cell brackets. See picture below. If the table is 5/16" from the pin deck, these tools should rest flat on the spots. Two locating tools may be used alternating between 1-7 and 1-10 spots.
7. Loosen the four bolts holding the table support assembly (Part #070 007 295 and #070 007 296) to the table (Part #070 002 684). Shift the table until Locating Tools point to the center of the 1, 7, 10 spots. See picture below.
8. Resecure table bolts, springs, spot and respot rods, and clevis pin. Remove 5/16" plates.



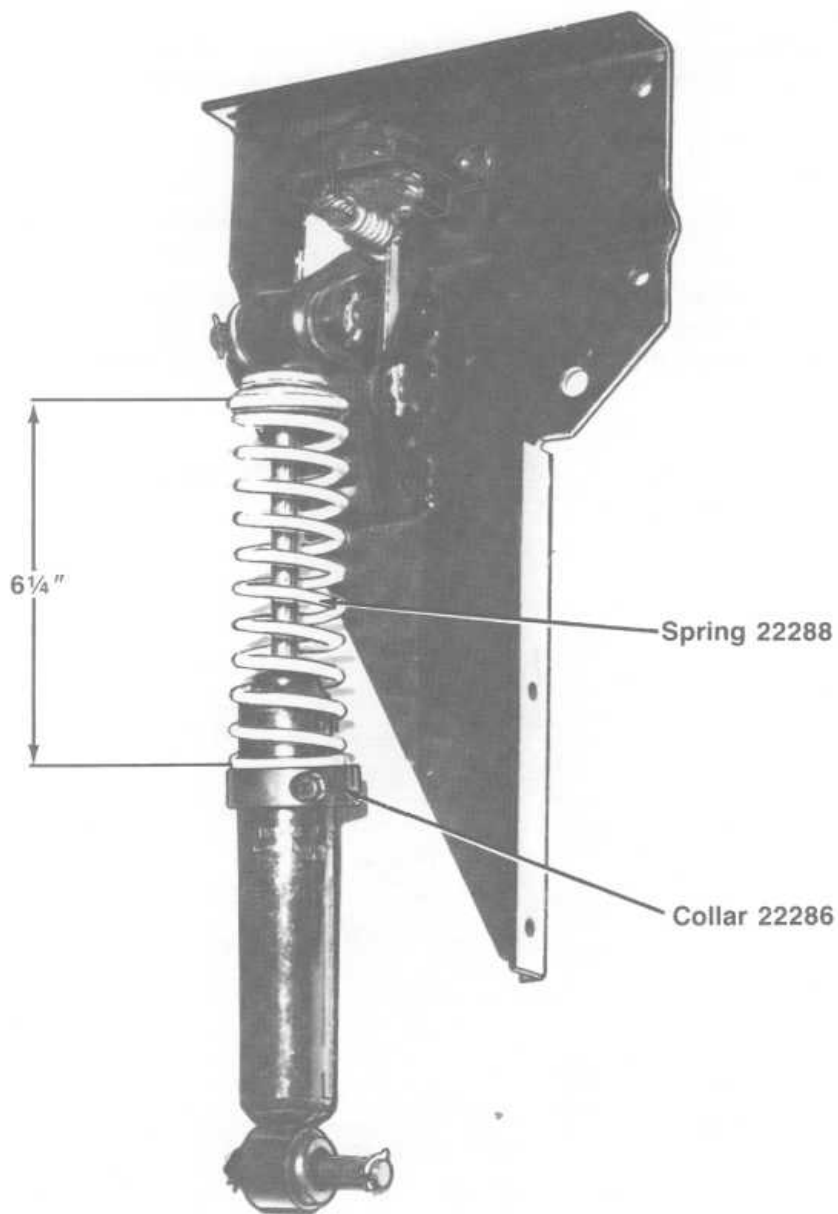
SPOTTING SOLENOID OPERATION

The spotting solenoid controls the operation of the table for spotting and respotting cycles. When the solenoid is energized, the cam lever unlocks the table drive mechanism. The shuttle stop is also disengaged at this time allowing the shuttle assembly to follow the contour of the cam transferring pins from the bin assembly to the spotting cups. In addition, the top end of the spotting lever is locked into position. This permits the spotting rod to follow the contour of the table spot cam. If the solenoid is de-energized, the spot lever is released which fixes the spotting cups in a horizontal position. The table drive assembly also remains locked.



SPOTTING SOLENOID ADJUSTMENTS

1. With the table at the electrical zero position (355°), the distance between the end of the stop lever (Part #6288) and the adjusting should be .015". Adjust bolt to meet these conditions.
2. If the spotting solenoid is replaced, it should be positioned so when it is manually operated (as if it were energized) the cam lever (Part #6278) should be in a locked position. This rigidity is necessary to trip the spotting mechanism during a spotting cycle. Tighten the solenoid mounting bolts uniformly to obtain the above conditions.
3. With table at zero, insert large end of ST-2748 gauge between spot lever and latch. Adjust linkage to obtain .176 inch clearance.



CUSHION SHOCK ABSORBER ASSEMBLY ADJUSTMENT

NOTE: This adjustment can be made either with the shock absorber mounted in the machine or held in a vise. **CAUTION:** If the shock absorber is held in a vise, clamp shock on end only. DO NOT PLACE PISTON IN VISE.

1. Loosen collar lock screw.
2. Insert a thin open end wrench between the coils of the spring with the open end of the wrench over the piston shaft and against the piston.
3. Hold wrench against piston while turning the spring. When the dimension of $6\frac{1}{4}"$ is obtained, slide collar against spring, tighten lock nut, then remove wrench.

TABLE SPRINGS OPERATION

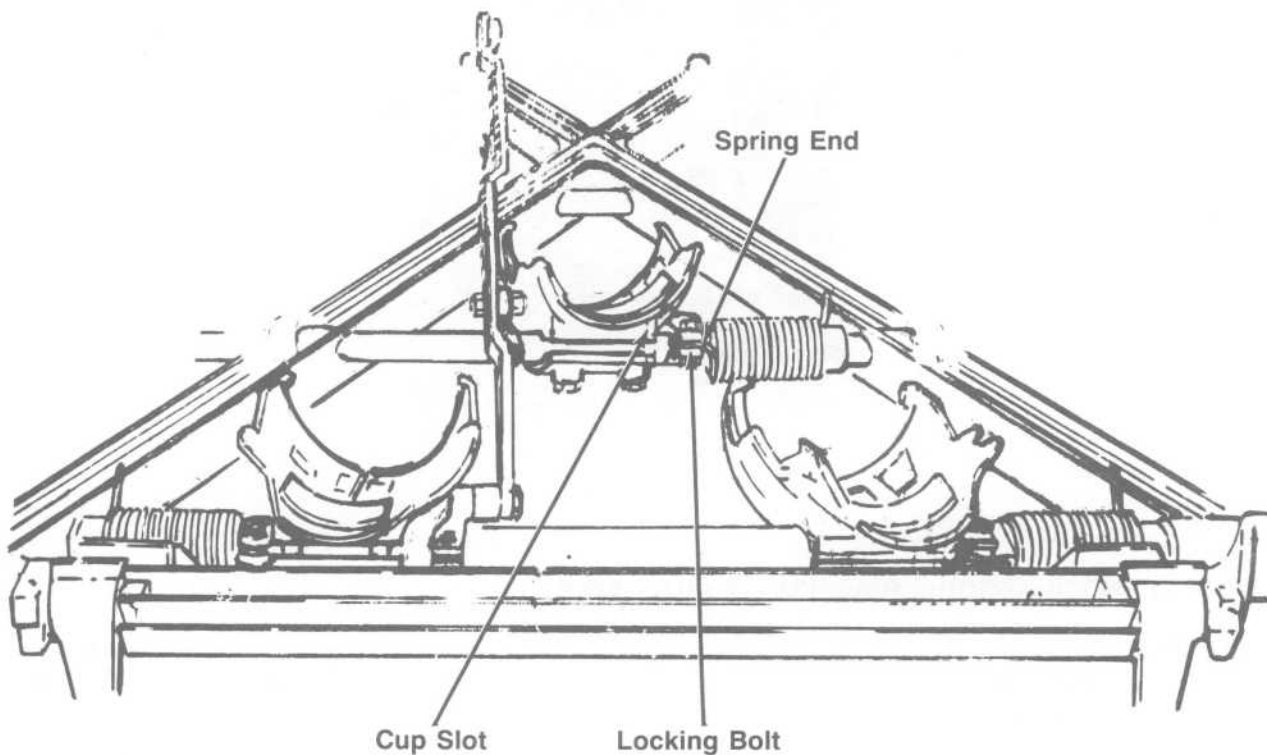
The table springs, located on the #3 and #4 yoke shafts, are used to stabilize the cup movement during the spotting operation. They also serve to hold the spotting cups horizontal during a respot cycle.

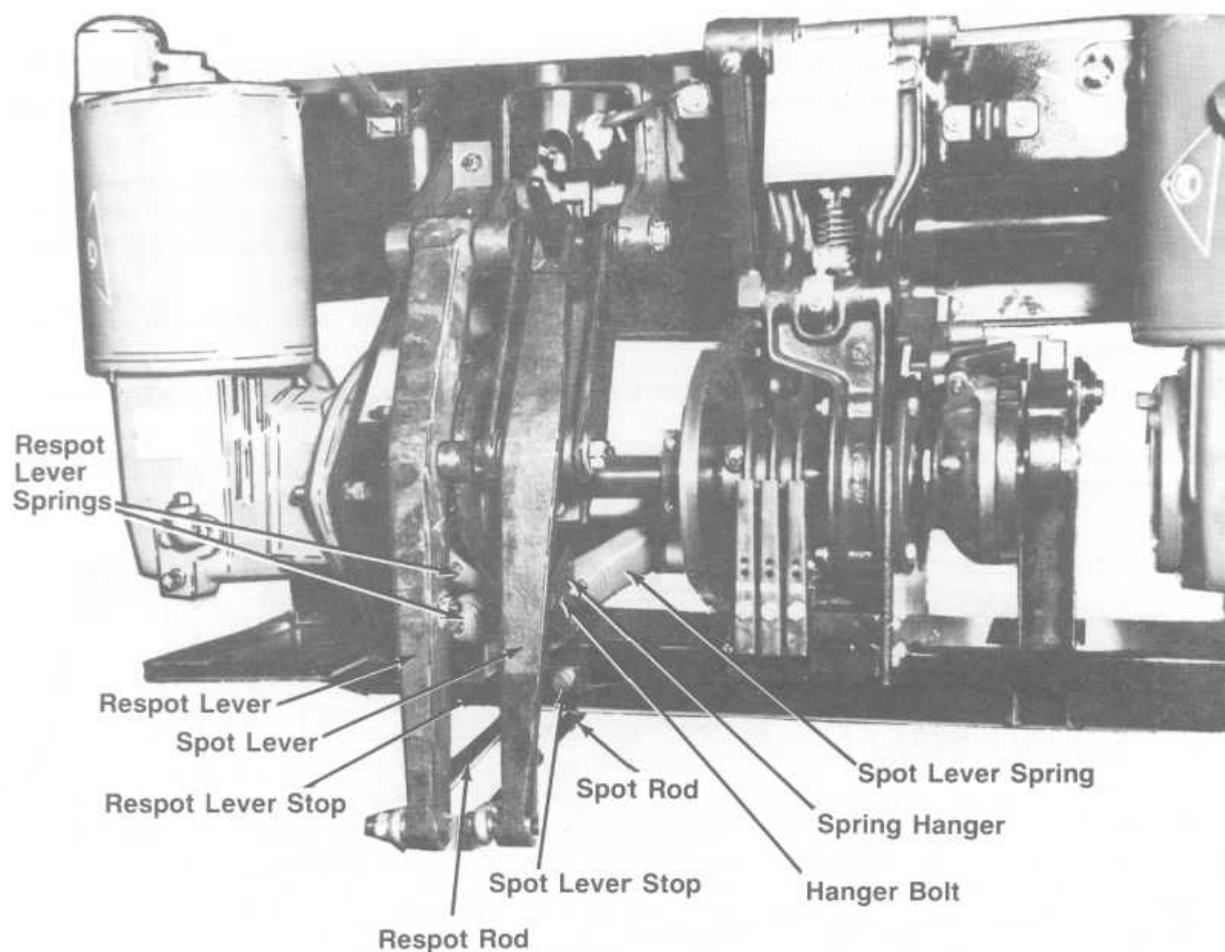
ADJUSTMENTS

With table in the zero position, loosen locking bolt and rotate spring retainer on table shaft so that spring end is in line with slot between cup and cup cap. This is the initial or approximate setting.

Run machine through several spotting operations and observe cup movement. Insufficient spring tension will cause unstable cup movement allowing the pins to wobble or fall when spotted. Too much spring tension will cause the cups to slam back after the pins have been spotted. Adjust accordingly.

NOTE: If springs have to be replaced, first remove yoke as described on page 5.40.





SPOT AND RESPOT LEVER SPRING REMOVAL OR REPLACEMENT

1. Hold trip latch down on table drive eccentric while holding spot lever latch up, and crank table down. To remove the one spot lever spring, stop table when minimum clearance is reached between spot lever and spot lever stop. To remove the two respot lever springs, stop table when minimum clearance is reached between respot lever and respot lever stop. This removes much of the spring tension.
2. Remove nut from spring hanger bolt.
3. Insert spring puller through center hole in spring hanger. Pull to remove tension from hanger bolt. While pulling, move bolt and hanger away from lever until free from hole.
4. To replace spring(s), reverse procedure in steps 3 and 2 above.

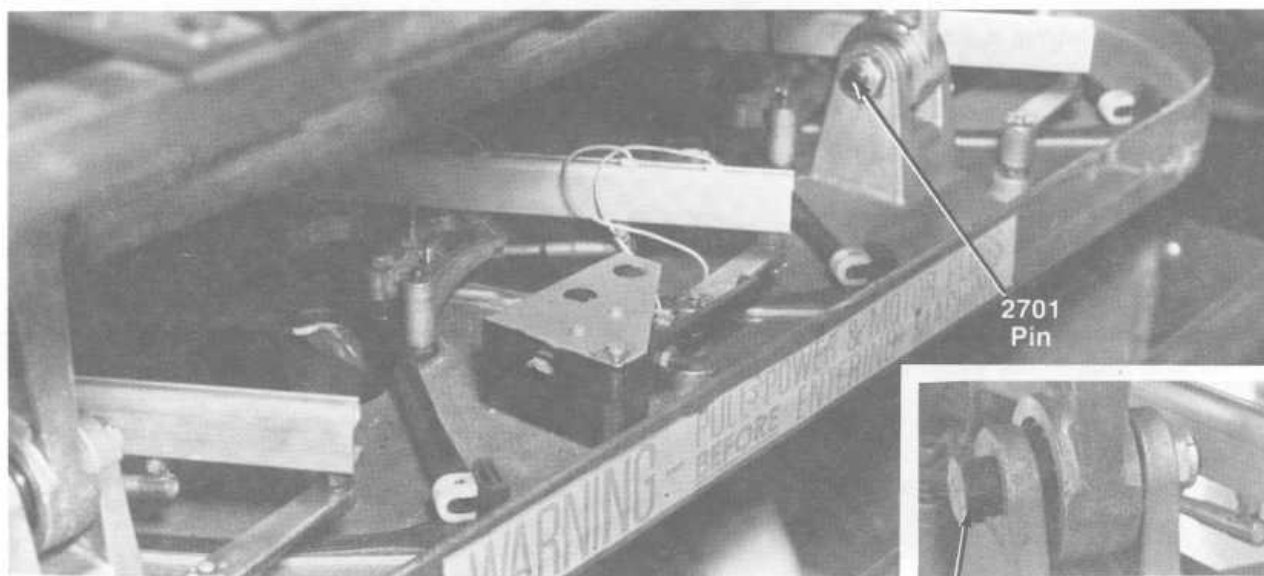
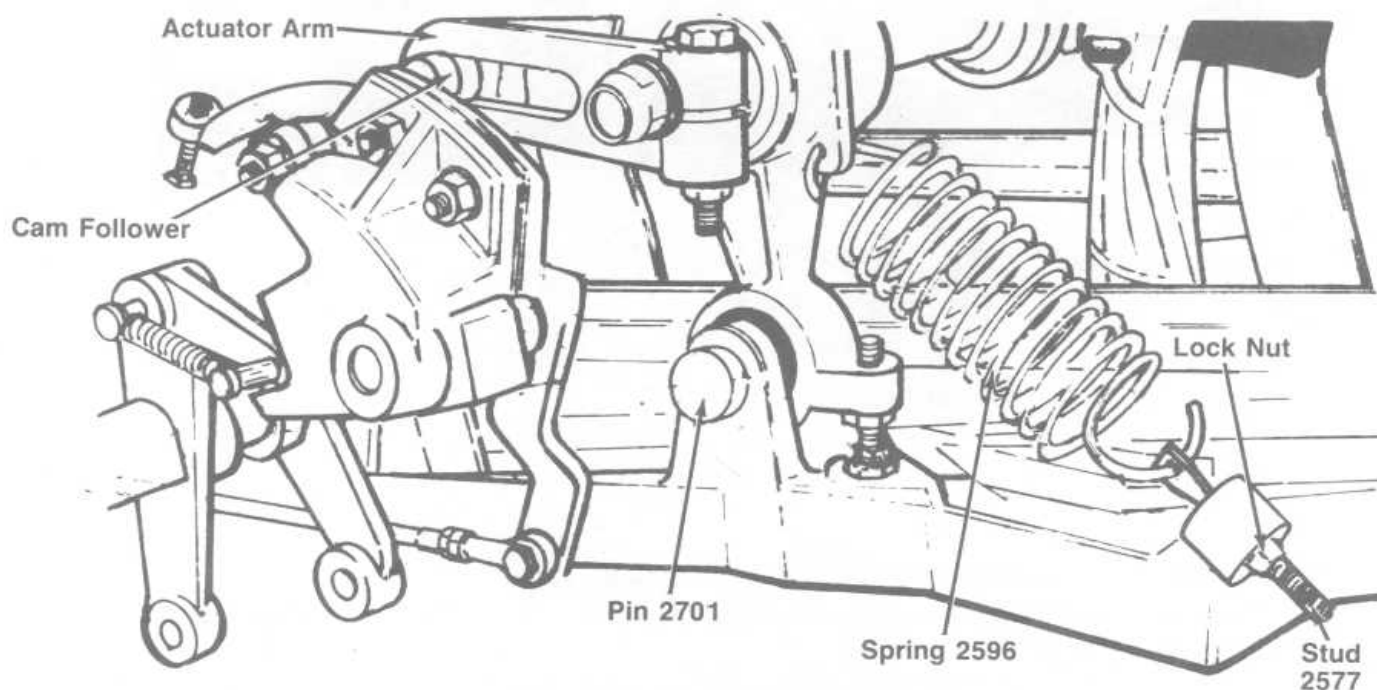
SPOT AND RESPOT LEVER STOP ADJUSTMENT

Turn the spot and respot lever stops in all the way. The stops will prevent damage to the spot and respot connecting rods in the event of a table malfunction. New machines may not have these stops.

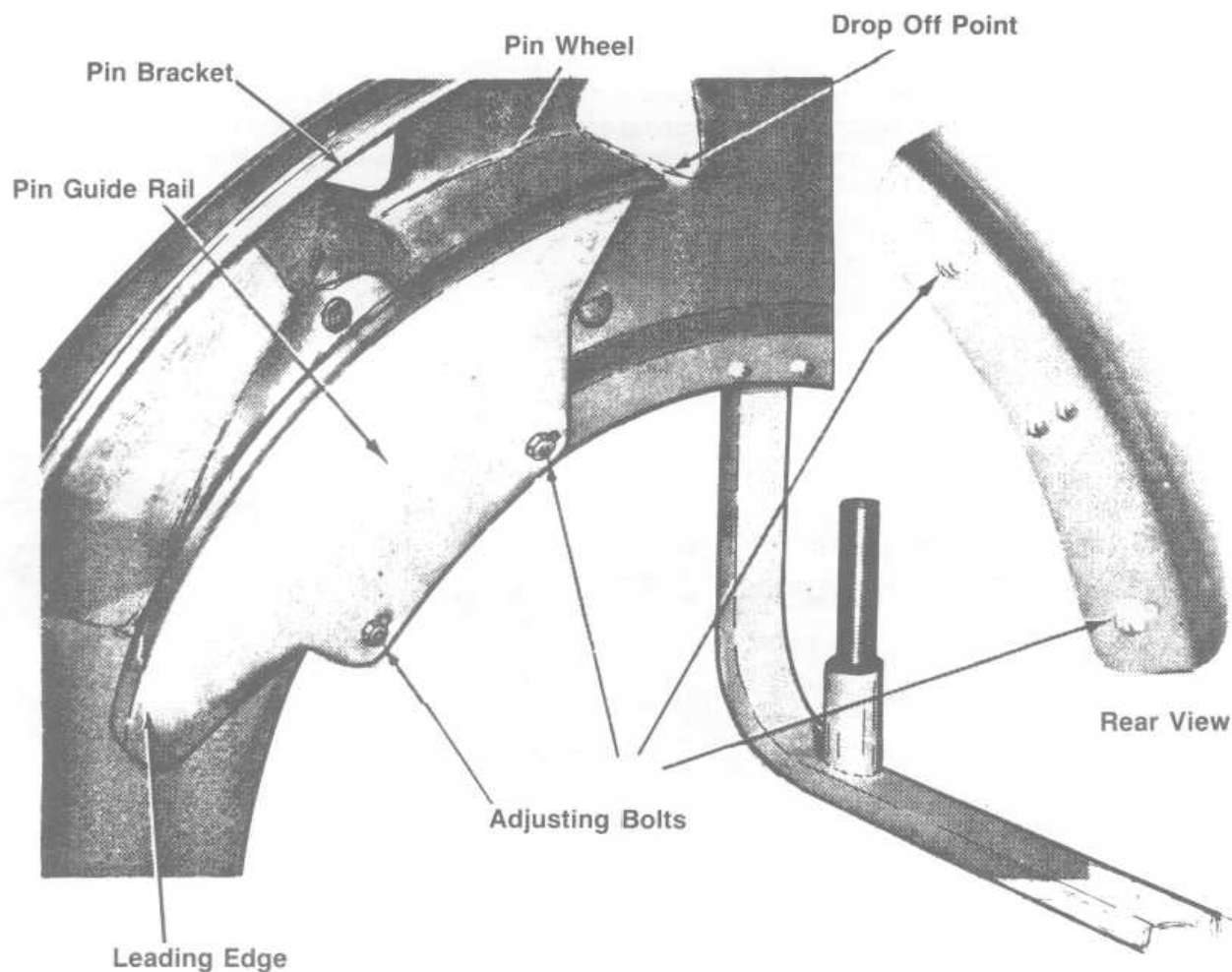
YOKE ASSEMBLY REMOVAL

1. With table at zero position, disconnect spot and respot rods from spot and respot levers. See page 5.39.
2. Hold trip latch down on table drive eccentric and crank table down to 180°. Remove pins from spotting cups.
3. With the table in this position and the spotting cups horizontal to the deck, some of the tension is removed from spring 2596. Loosen lock nut on stud 2577. This will remove more tension from spring 2596. Before removing lock nut completely, hold tension on spring 2596 with spring puller. This will ease the removal of the lock nut and prevent from stripping the threads of the stud.
4. Remove the lock nuts from the pins (Part #2701) which join the yoke to the table in 4 places—2 in front and 2 in back.
5. Slide yoke to the right to free actuator arm from cam follower. The yoke can now be removed from the table.

NOTE: If the yoke is broken, it can be repaired with Yoke Repair Kit, Part #610 704 011. It is not necessary to remove the yoke from the table in order to make the repair.



2701 Pin

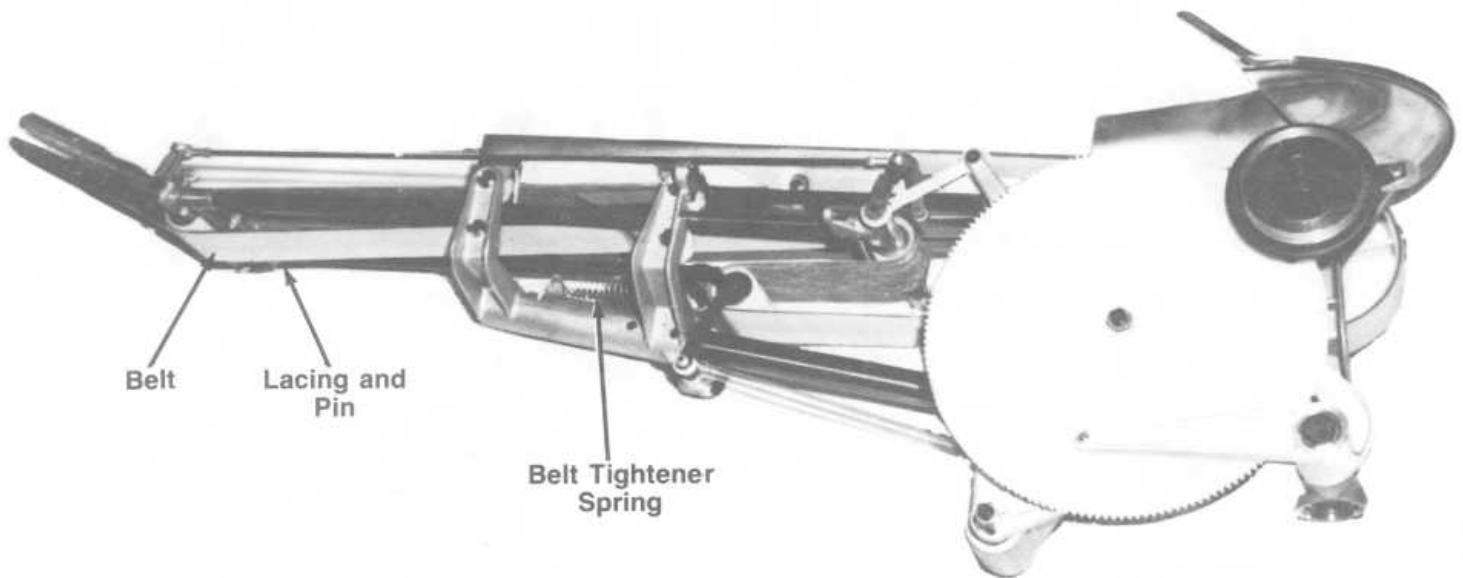


PIN GUIDE RAIL ADJUSTMENT

1. Position pin guide rail so adjusting bolts are centered in the slotted holes as shown. (Front and Rear)
2. Run machine and observe pins entering between pin wheel and leading edge of guide rail. Pins at this point should be held loosely so as not to jam the pin wheel.
3. Run machine and observe pins orienting to the distributor, (butt first and head first). Pins should drop onto center of distributor pan, and roll free of pin wheel. Adjust pin guide rail so pins are held securely but not tightly in pin wheel at drop off point.

DISTRIBUTOR OPERATION

The distributor transfers pins from the elevator wheel to the bin assembly. The large nylon gear serves a dual purpose. The outside of the gear contains a cam which moves the distributor to the various cup locations. The other side of the cam controls the telescoping action of the front portion of the distributor. Springs keep the cam followers against the cams. The distributor is driven through an adjustable clutch through its various positions.



DISTRIBUTOR BELT REMOVAL

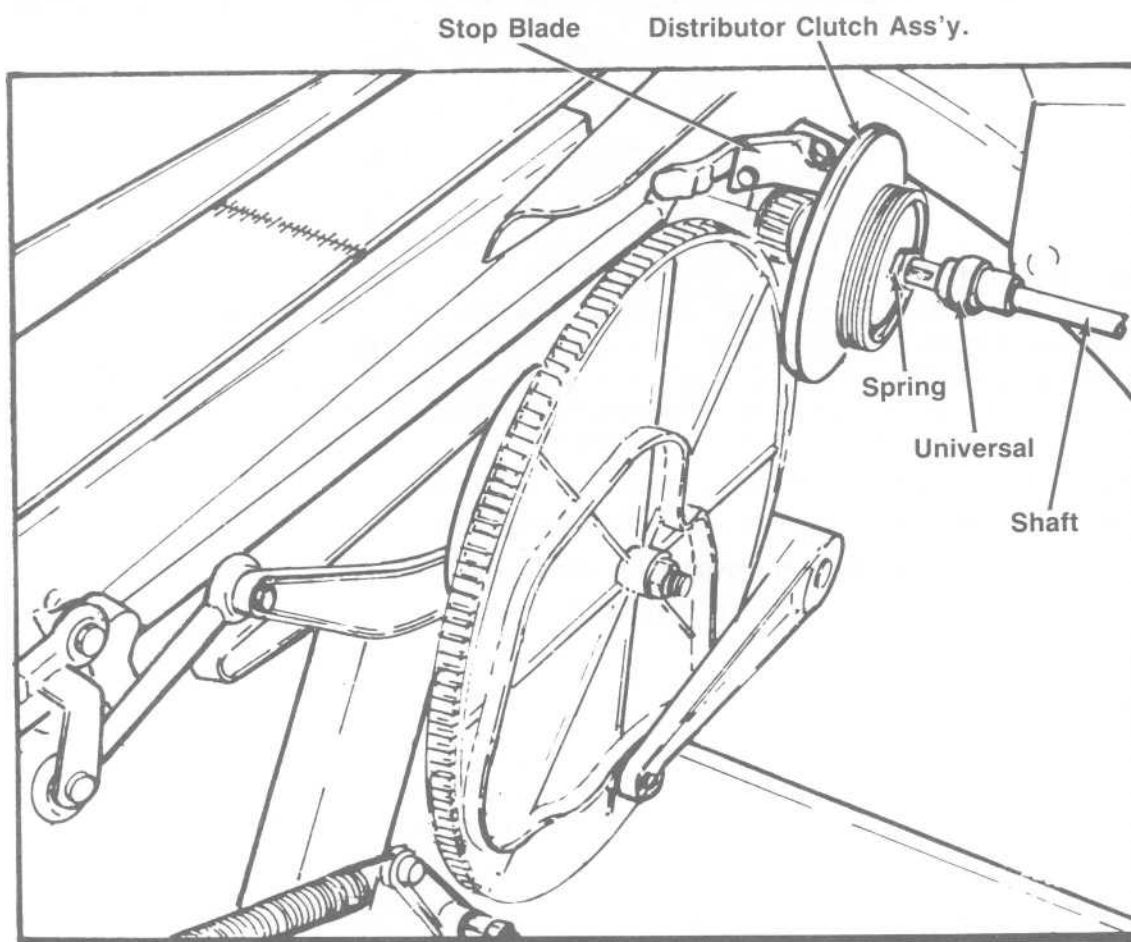
1. Remove belt tightener spring.
2. Locate belt lacing and remove belt pin. Distributor belt can now be pulled from the distributor. The approximate belt length is $116\frac{1}{4}" \pm \frac{1}{4}"$.
3. To increase belt tension, cut off one end of belt. Spring length will increase one-half of the amount cut off belt. (If one inch is cut off belt, spring length will increase one-half inch.)
4. Use clipper belt lacer ST-3542 to install new clips on belt. See page 4.5 for use of belt lacer.

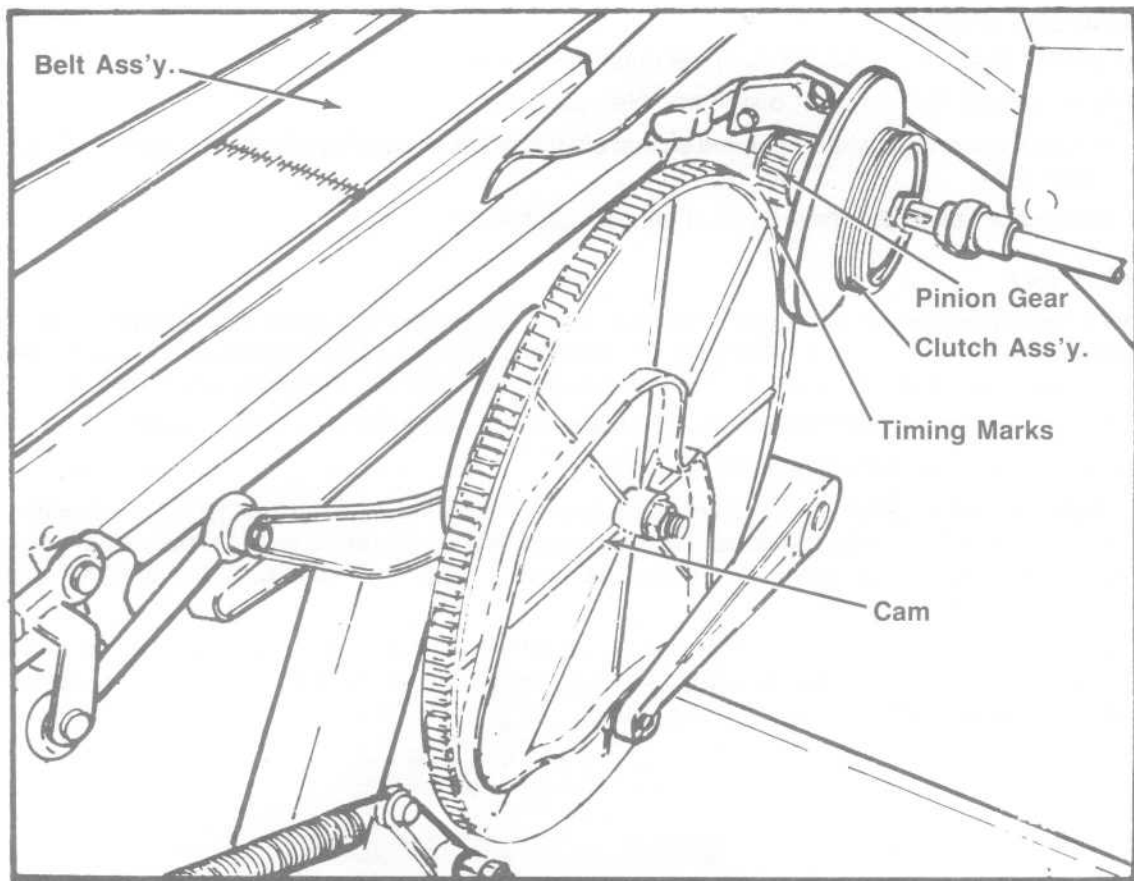
DISTRIBUTOR REMOVAL

1. Disconnect shaft and universal from distributor drive unit.
2. Remove springs from base of distributor. See page 5.46.
3. Make sure that elevator wheel is turned so that pin bracket is not directly above orientor pan of distributor. See page 5.41.
4. Lift distributor assembly upward out of support casting.

REPLACEMENT

1. Check level of distributor mounting bearing. This should be level in both directions. If adjustment is needed, loosen distributor bracket mounting bolts and position accordingly. Spacers are used between distributor bracket and machine weldment to insure distributor will clear bin assembly by at least $3/8"$.
2. To replace distributor drive assembly, do above removal procedure in reverse order.
3. Check timing marks as indicated on page 5.44.
4. The clutch spring is to be set at one complete turn of the spring. The most difficult drive position is between the 6 and 10 pin feed positions. If the spring tension is not strong enough, the distributor will stall between the 6 and 10 positions. If too much tension is applied, it will cause stalling of the distributor or failure to index.
5. When the distributor is at the #1 bin position, the distance between the distributor orientor pan and the elevator wheel should be approximately $1/4"$. If adjustment is necessary, loosen orientor pan attaching bolts and position accordingly.





DISTRIBUTOR CAM

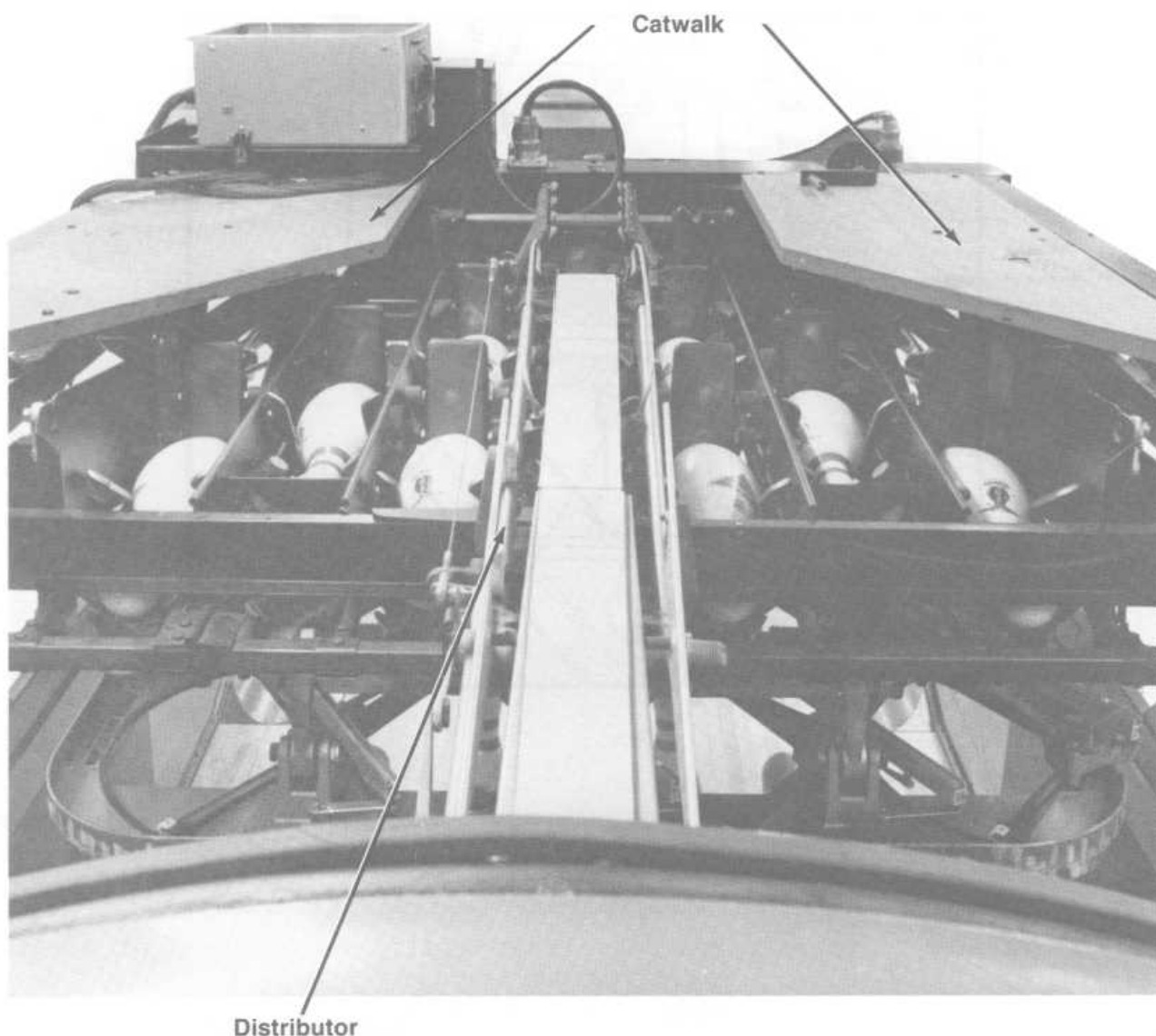
The cam has a bump on each side of its outer edge at the base of the valley between teeth. This locating mark and marked tooth of the pinion gear are to be matched for proper timing. The nylon cam is flexible and can be disengaged from the pinion gear by applying pressure towards the distributor where the gears mesh. The outer face of the large cam is marked for the feed position for each pin. The timing marks are in line only when the distributor is at the #1 bin position.

If the above conditions are not met, improper pin feed will result.

The inside of the cam controls the telescoping of the distributor.

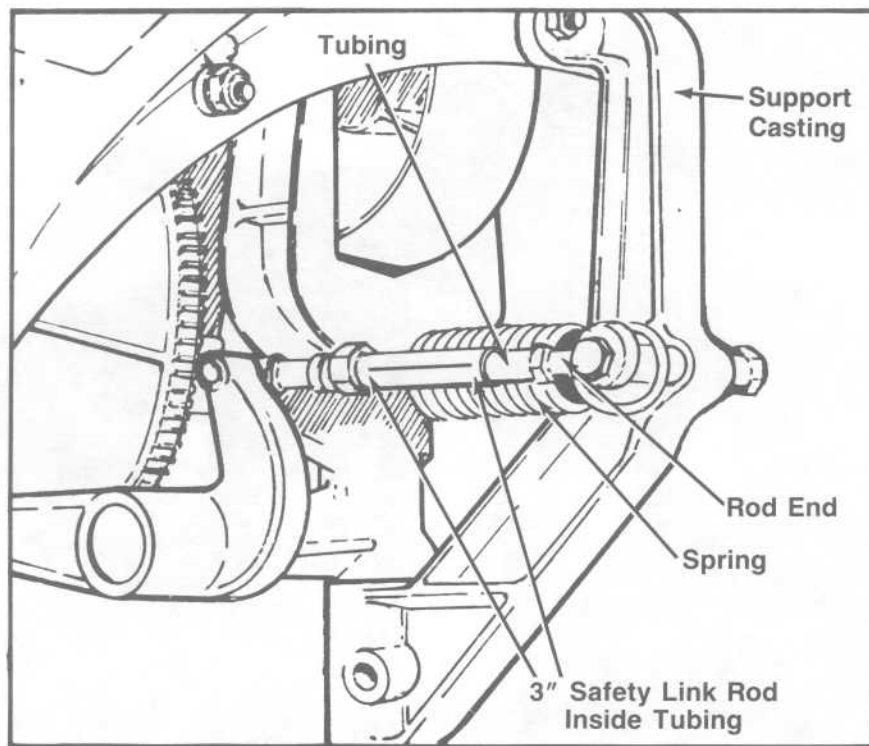
The outside of the cam controls the movement to various bin locations.

The pin feed sequence is 1, 3, 2, 4, 7, 8, 5, 6, 10, 9.



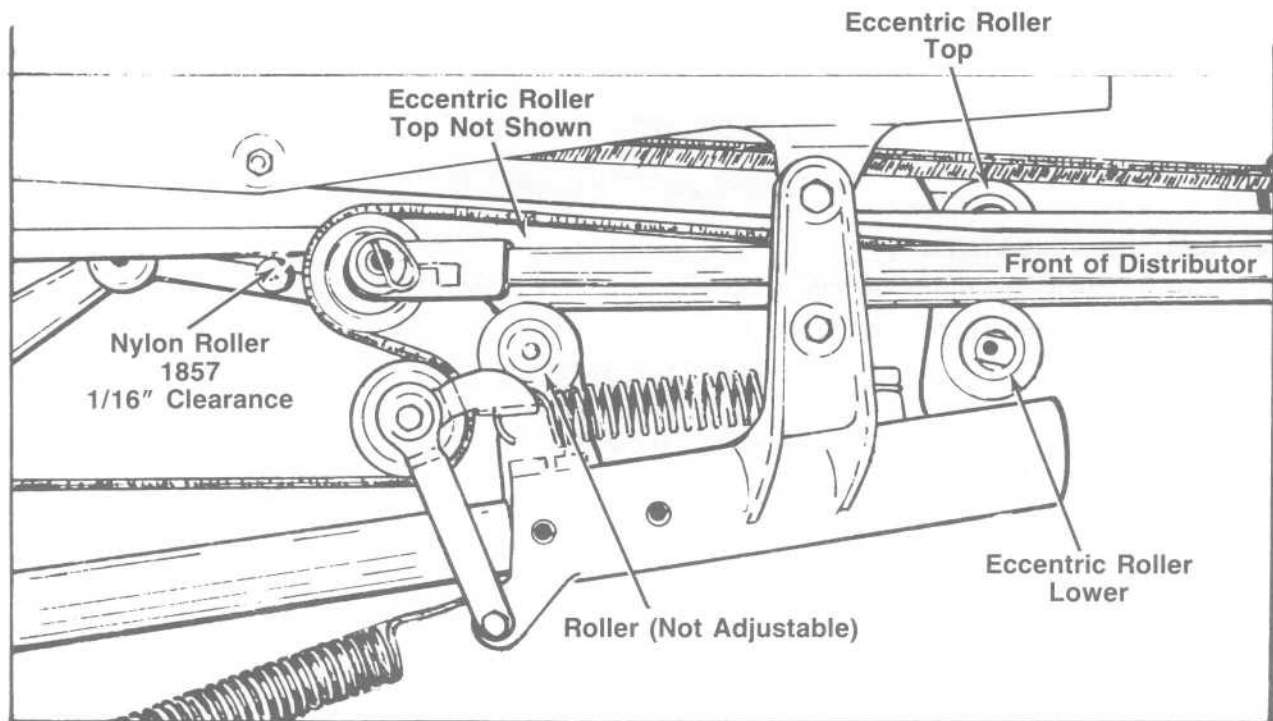
DISTRIBUTOR ADJUSTMENTS

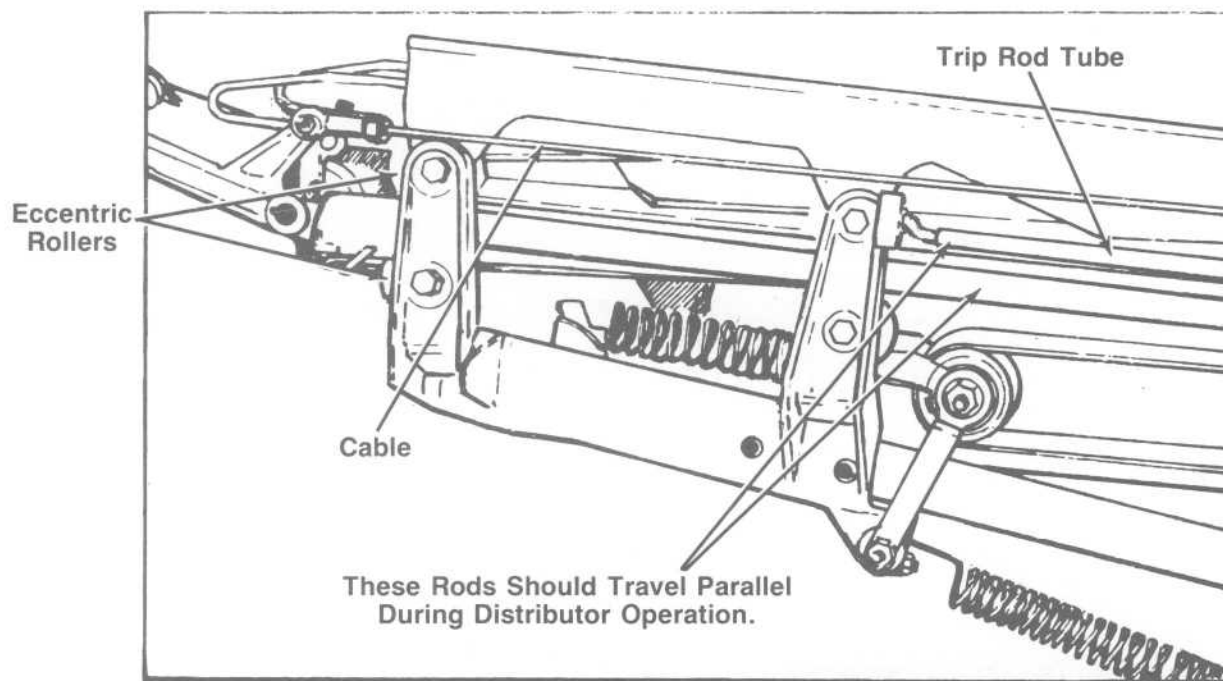
1. Index distributor trip arm assembly to position distributor at the #1 bin pocket.
2. Inspect nylon cam gear to assure that timing marks match with pinion gear. See page 5.44.
3. Distributor should be in line with the #1 and #5 bins. If distributor is not in line, loosen rod end and adjust tubing accordingly. See page 5.46.
4. Operate machine and note pin feed operation at the individual bin pockets. The tubing may have to be readjusted to obtain accurate feeding of pins.



DISTRIBUTOR ADJUSTMENTS

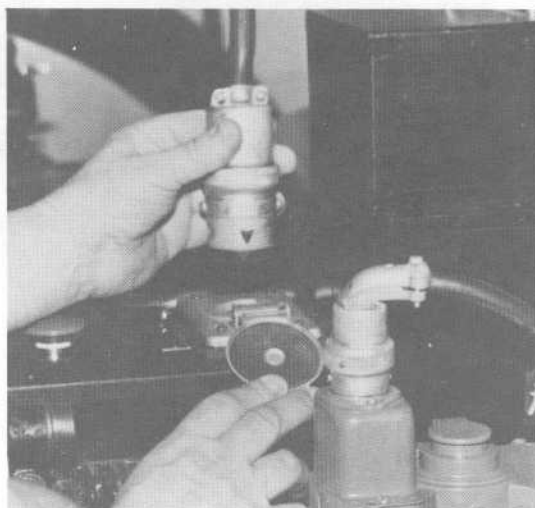
A safety link is provided to act as a distributor stop should the distributor be jarred out of position. The length of the safety link should not exceed 3" from the lock nut to the rod end to avoid bottoming in the mating tube. This dimension is set at the factory and need only be checked when replacing the link.





DISTRIBUTOR ROLLER ADJUSTMENTS

1. Starting with the distributor at the #1 bin position, telescope the distributor so that it is at its minimum length. See above picture.
2. Position front lower eccentric roller in its lowest position; that is, so that the distance between the roller and the carriage tube is at its maximum.
3. Bring the top rear eccentric roller down until there is a noticeable drag against the carriage tube when you turn the roller. (Too much drag could prevent the distributor from extending.)
4. Adjust the upper front eccentric roller until the trip rod tube and carriage tube are parallel to each other. See photo, page 5.46 and above photo.
5. Position the front lower eccentric roller up until it just makes contact with the carriage tube.
6. Adjust cable so that the clearance between the nylon rollers and the trip rod tube is equal. (This clearance will be about 1/16" in all positions of the distributor.) See photo, page 5.46.



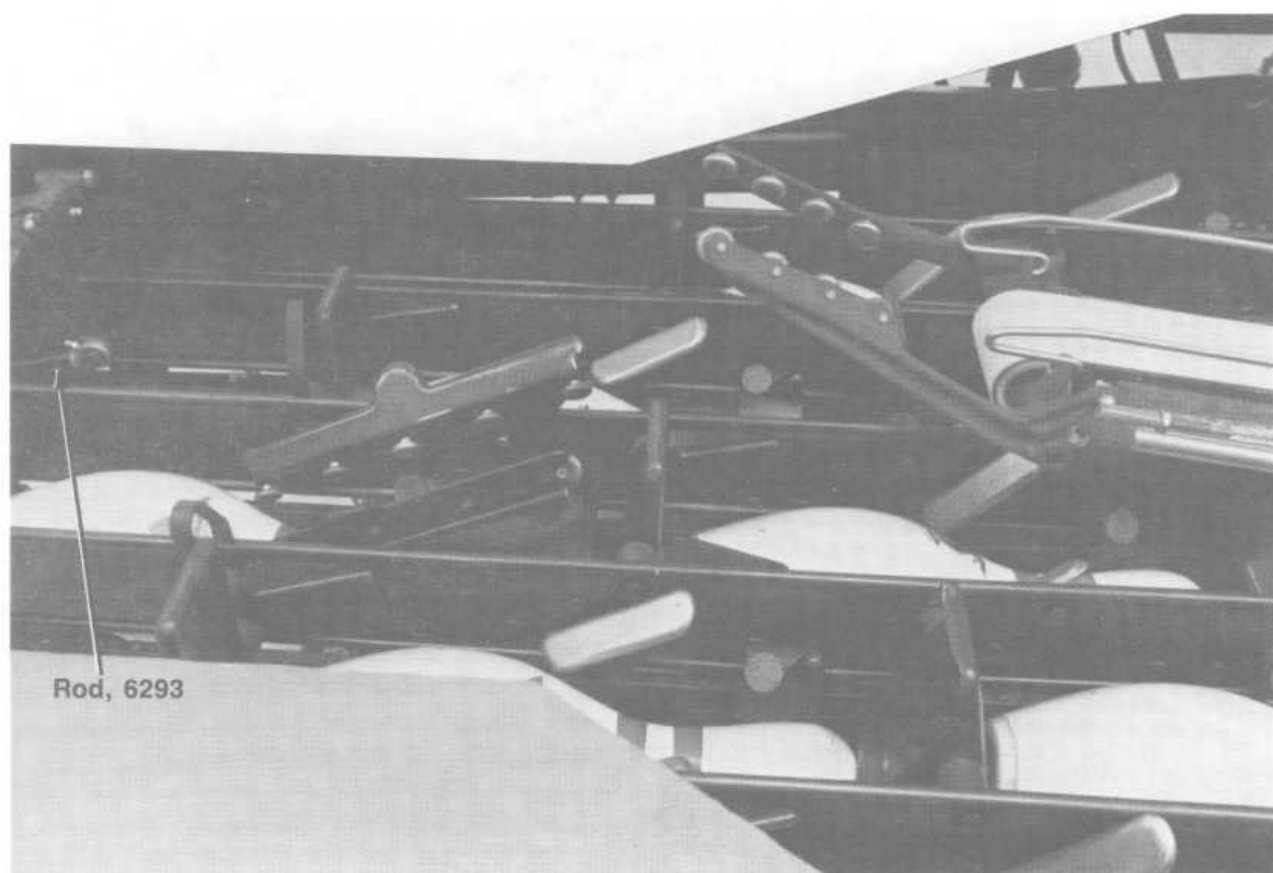
**Remove Power Plug
When Working on Machine.**

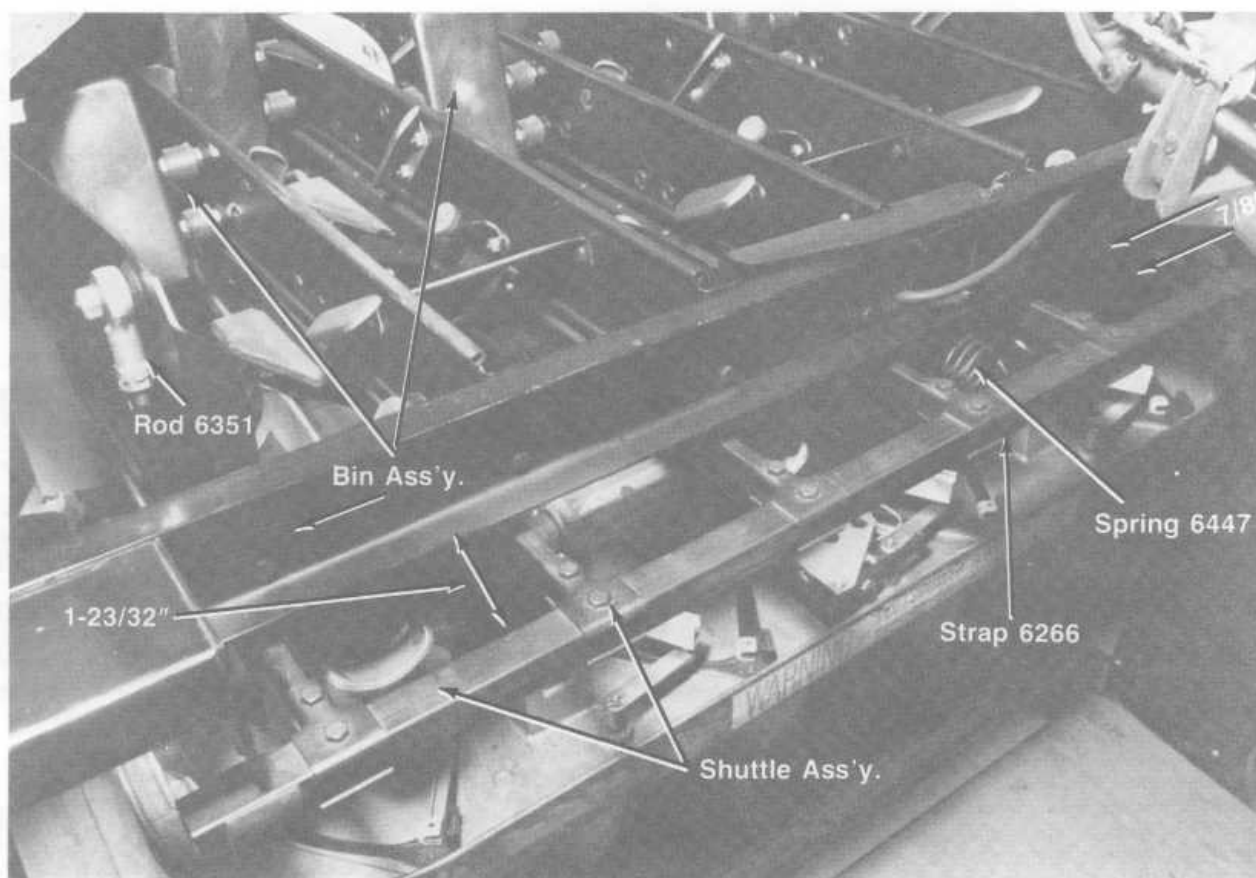
DISTRIBUTOR TRIP LEVER ADJUSTMENT

1. Operate trip lever, inspect for mechanical binds in lever and associated linkage.
2. The distributor trip lever assembly is spring loaded by means of spring, part #6035 located at the rear of tube #6004. This spring is factory set for 1/2 turn. See photo, page 5.49.



**Remove Power Plug
When Working on Machine.**





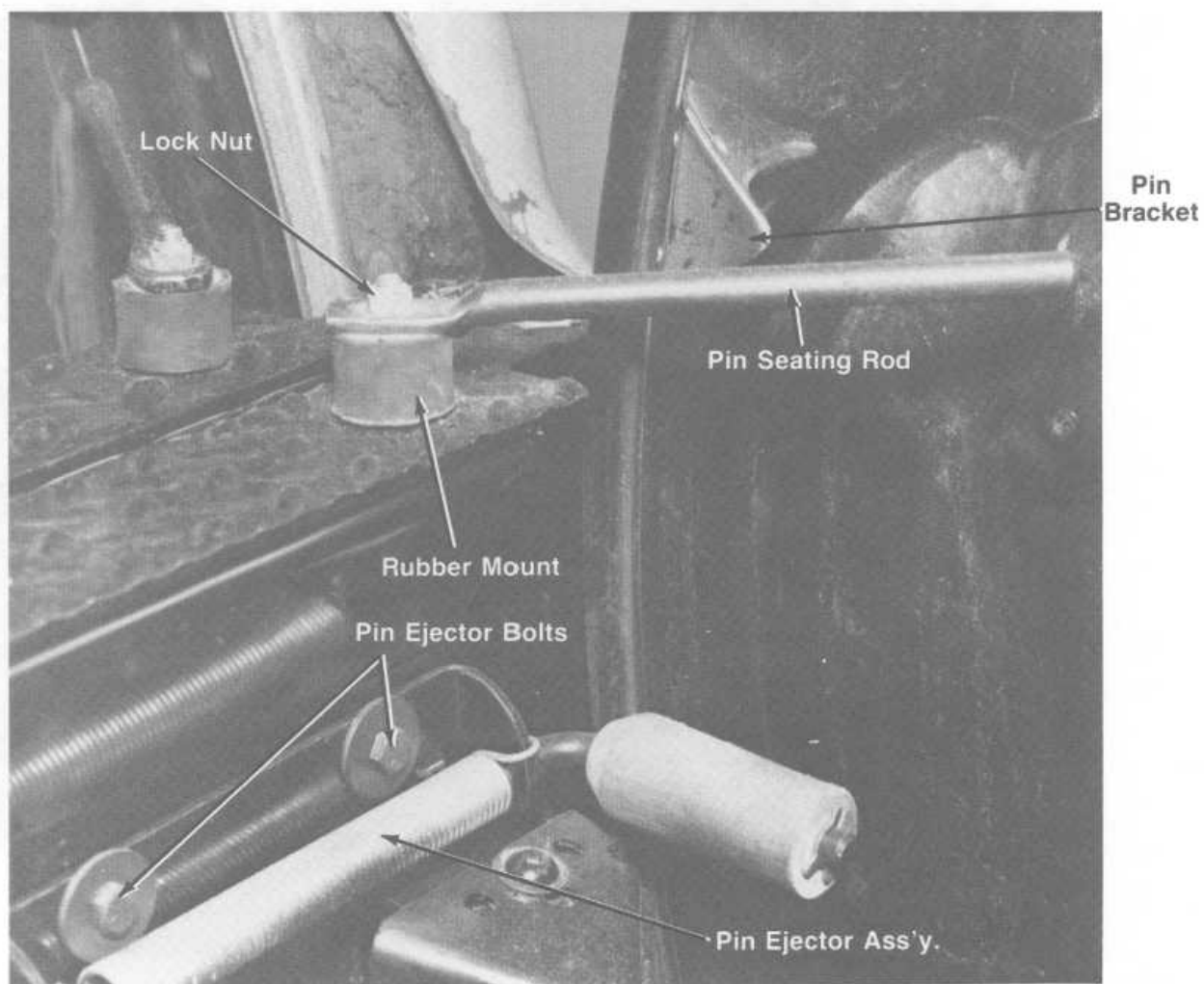
SHUTTLE AND BIN OPERATION

The shuttle holds the pins in the storage bin and drops them into the table spotting cups when required. The bin assembly should be centered over the spotting cups. Should it become necessary to reposition the bin, slots are provided at the rear corner support brackets for lateral movement.

ADJUSTMENT

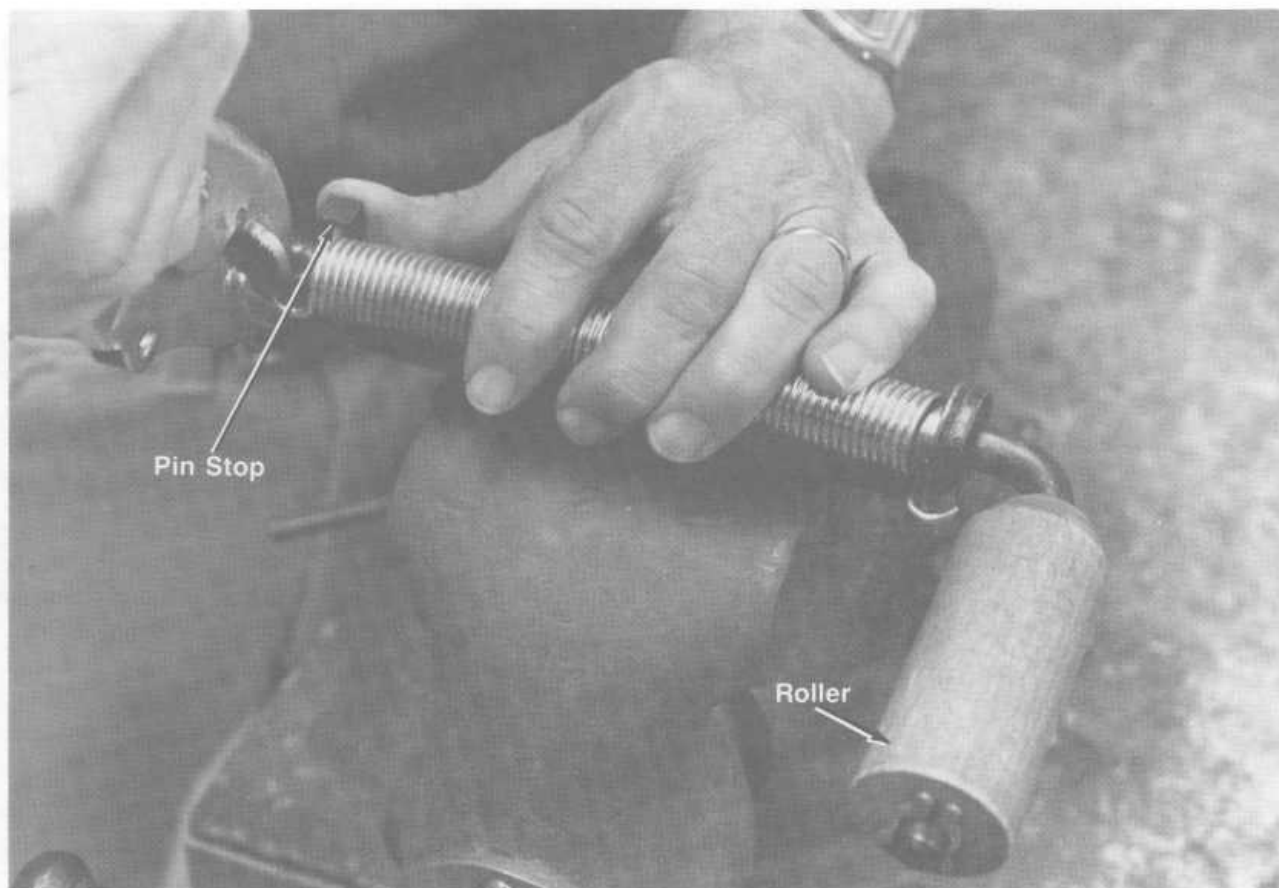
NOTE: Adjustments must be made with no pins in the bins.

1. There should be approximately 1-23/32" between the back channel to the leading edge of the shuttle assembly measured at the center. To make this adjustment, loosen lock nut on connecting rod 6293 and adjust accordingly use guage ST 6519. See page 5.49.
2. The shuttle assembly should be centered directly under the bins. Adjustment is accomplished by repositioning spring 6447 to another location on the spring strap 6266.
3. The distance from the rear frame of the bins to the shuttle assembly should be 7/8". Adjust rod 6351 to obtain this dimension (each side).



PIN SEATING ROD ADJUSTMENT

Loosen lock nut and position rod so that it clears the Pin Bracket by approximately $\frac{1}{2}$ ". Tighten lock nut.



PIN EJECTOR REMOVAL

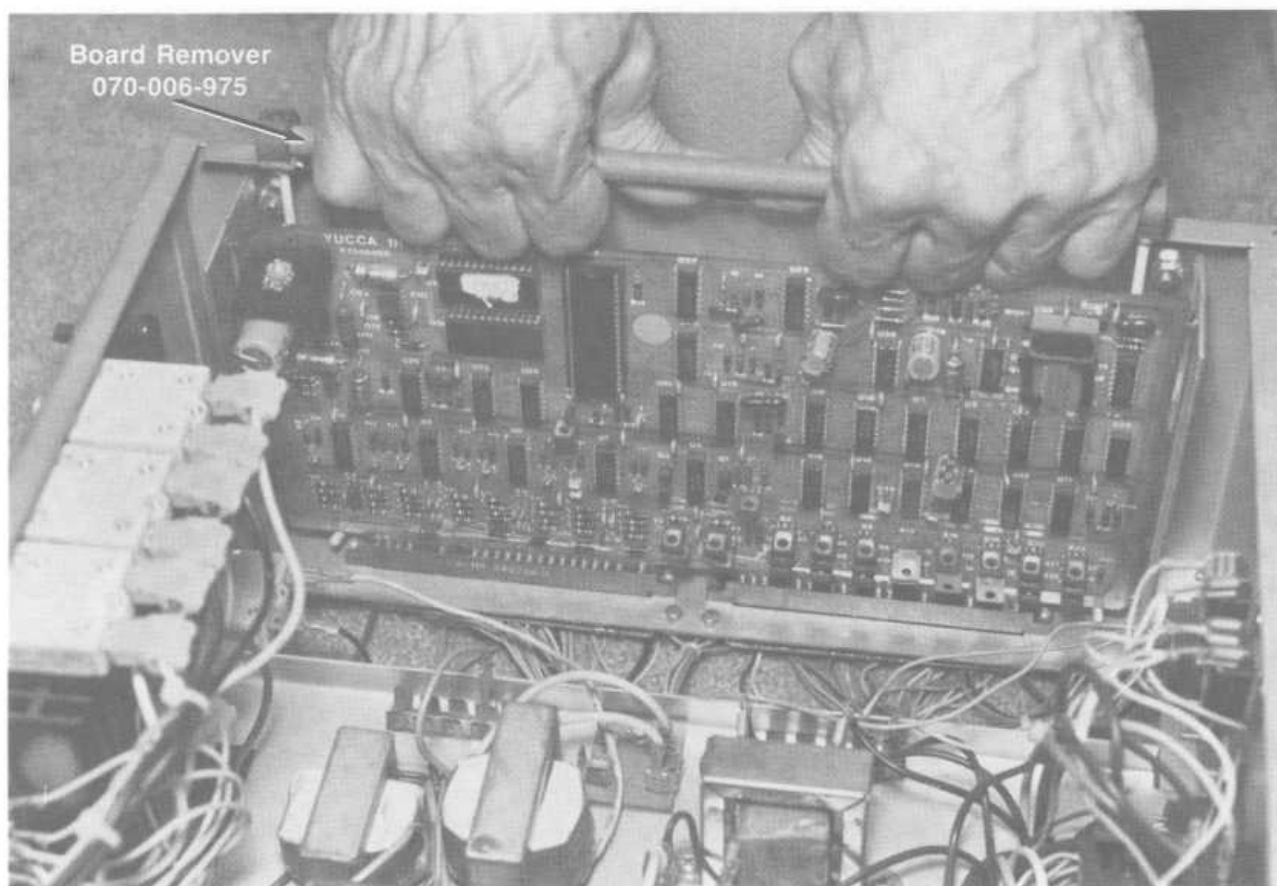
1. Loosen bolts and remove pin ejector ass'y. From side plate of machine. See photo page 5.51.

REPLACEMENT

1. Position pin ejector ass'y. in machine so that the leading edge of roller ass'y. is in line with the machine plow.
2. Tighten bolts.

ADJUSTMENT

1. Insert pin ejector ass'y. (Part 000 024 507 L.H. or 00 024 508 R.H.) in vise as shown in photo above.
2. Remove "X" washer and slide shaft out of bearing end.
3. Grasp end of spring with vise grip pliers and wind spring 1½ turns.
4. Maintaining tension on spring, position roller and shaft and install pin stop.
5. Release vise grip pliers and spring will fall into position.
6. Install "X" washer in groove provided on shaft.

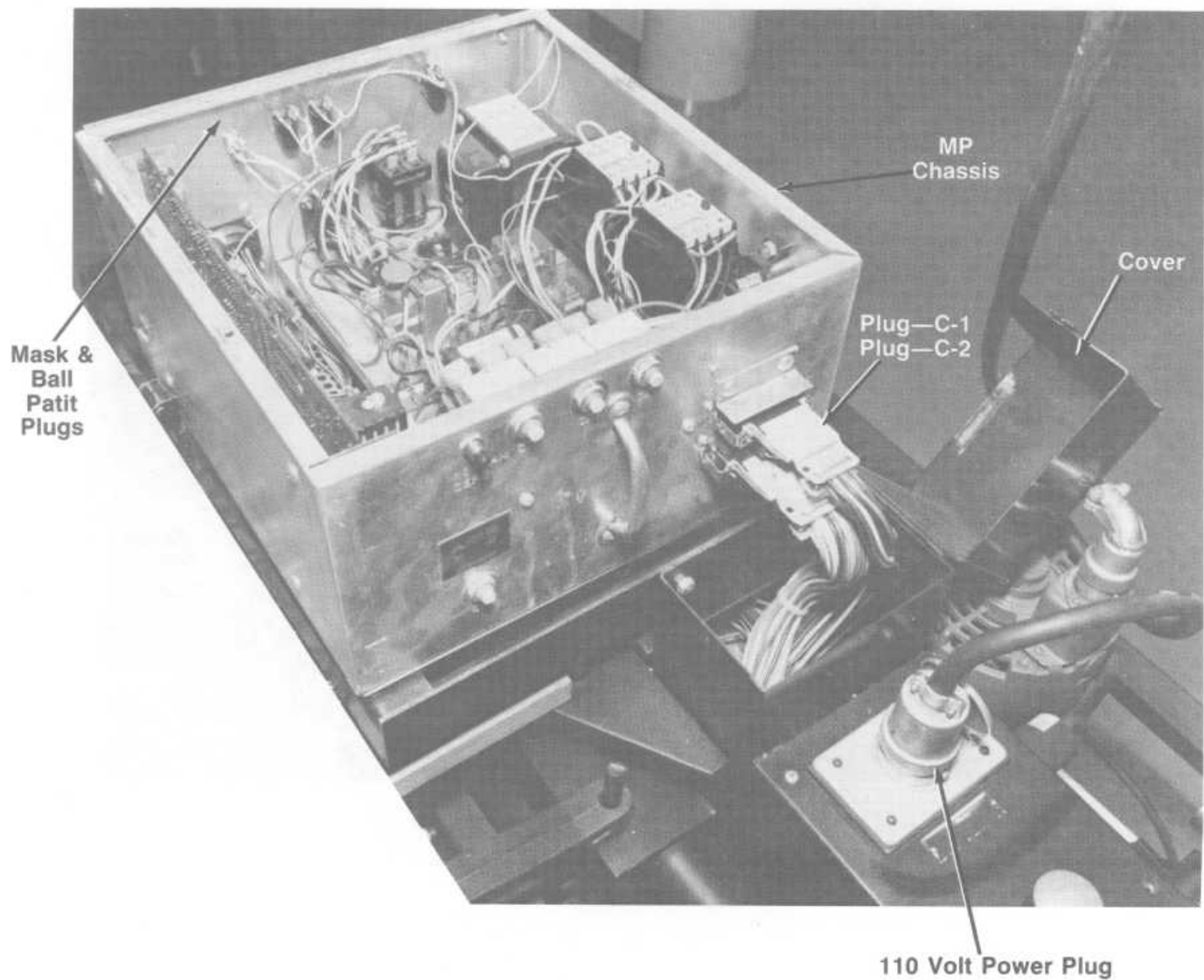


PRINTED CIRCUIT BOARD REMOVAL

NOTE: Remove power and wait one minute before removing boards

1. Insert board puller under board to be replaced as shown in the above picture. (Care should be exercised as puller may become caught in stray chassis wires.)
2. Apply an upward pressure using the thumbs as leverage, and ease the board out of the socket.
3. When inserting a new board, be sure the printed circuitry of the board mates with the contacts of the plug.

NOTE: Board removal tool not required with new M/P circuit boards.



CHASSIS REPLACEMENT

1. Remove 110 volt power to the machine by pulling the power plug.
2. Release the camloc handles which hold the chassis to the frame of the machines.
3. Loosen the plug cover and disconnect the "C" and ball path plugs by firmly depressing the spring clips and pull outward.
4. Lift chassis out of position and replace with new one following the reverse order.
5. Apply power to the pinspotter and check operation for first ball, second ball, strike, and foul cycles.

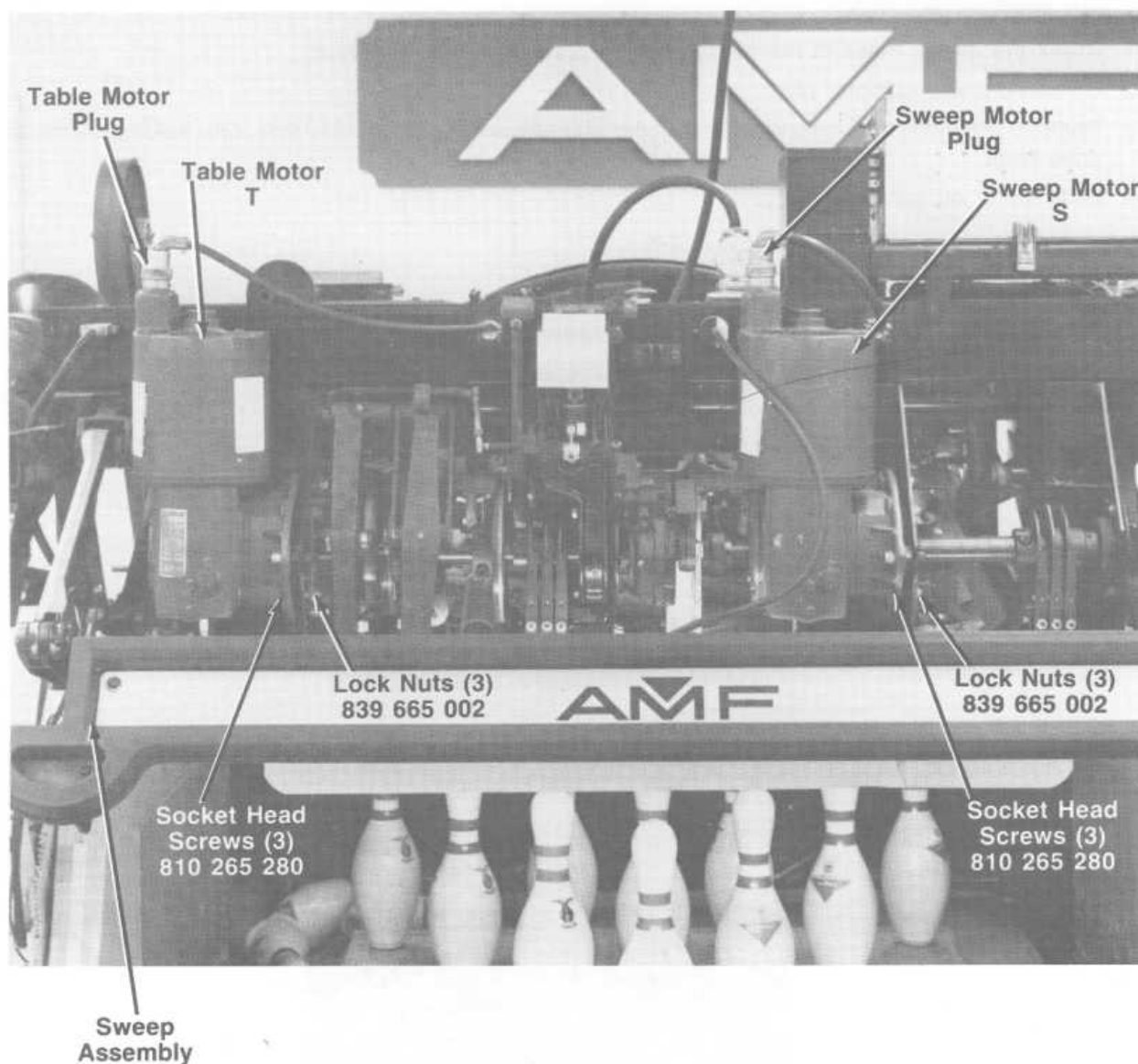


TABLE MOTOR REMOVAL

1. Crank table down in spotting position. Place a wooden block between the table and the pin deck.
2. Crank the sweep down to the guard position.
3. Disconnect table motor plug.
4. Remove the three lock nuts (Part #839 665 002) and screws (Part #810 265 280) holding motor on to drive shaft.
5. Slide motor off splined shaft.

REPLACEMENT

1. Spread a light coating of general purpose grease on splined motor drive shaft.
2. Slide motor onto shaft and install the three screws and lock nuts.
3. Connect table motor plug.
4. Run table and sweep to zero position.

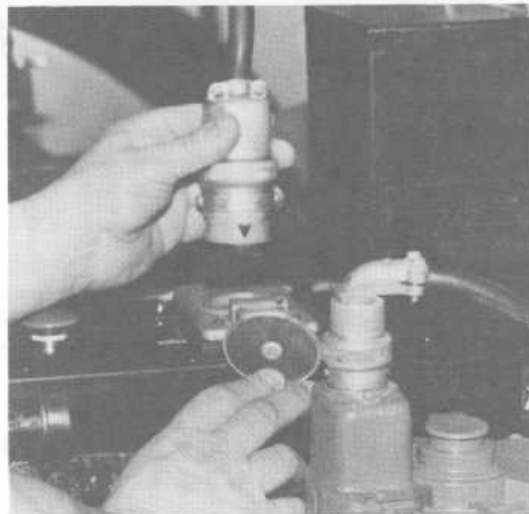
SWEEP MOTOR REMOVAL

1. Crank the sweep down to the guard position. See page 5.55 for photo.
2. Disconnect sweep motor plug.
3. Remove the three lock nuts (Part #839 665 002) and screws (Part #810 265 280) holding motor on to drive shaft.
4. Slide motor off splined shaft.

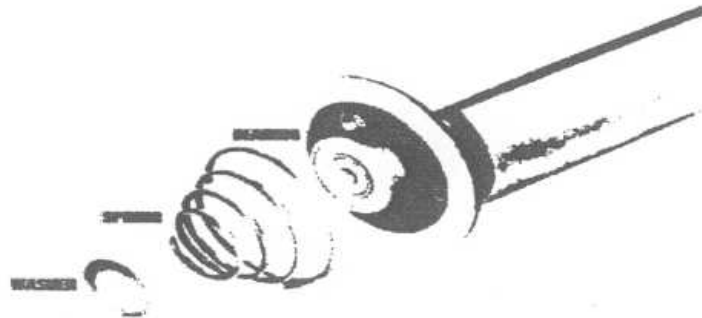
REPLACEMENT

1. Spread a light coating of general purpose grease on splined motor drive shaft.
2. Slide motor onto shaft and install the three screws and lock nuts.
3. Connect sweep motor plug.
4. Run sweep to zero position.

NOTE: Table and sweep motors are interchangeable.



**Remove Power Plug
When Working on Machine.**



Carpet Tracking spring

- When a carpet belt doesn't track properly we always try to correct the problem in the same way.
- Cleaning bearing supports and freeing them on their pivot studs along with rebuilding the front roller usually takes care of the problem.
- But occasionally no matter what we try we have a carpet belt that just will not track correctly.
- Should this occur, we might want to try using a conical spring on the end of the front roller that we want the carpet to move toward.
- To install a spring the bearing must be removed from the end of the roller. The spring is put in place followed by a protective washer and then the bearing.
- The carpet will track toward the spring. If tracking is over corrected try cutting off a portion of the spring.
- Trim a little at a time off the large end of the spring until tracking is correct.
- 030 007 858 Washer 030 007 859 Spring

CARPET REMOVAL PROCEDURE

NOTE: The adjacent machine must be turned off and not used while the carpet is being removed. The cushion may be removed to provide more working room.

1. Disconnect carpet and ball lift drive belts from carpet pulley drive assembly.
2. Remove paddle from rudder arm
3. The front roller must now be released from its bearing supports. See page 4.4 for instructions.
4. The front roller can now be removed by rolling it over the bounce plate and out the ball opening into the adjacent machine.
5. Unhook rear roller support from its bracket and tip rear roller from its bearing support.
6. Remove carpet drive pulley. (It may be necessary to slide rear roller out several inches in order to provide enough clearance to remove pulley.)
7. Remove four lock nuts holding bounce plate assembly to pit support brackets. Lift and slide bounce plate several inches toward the front of the pit.
8. The rear roller can now be removed by first freeing the roller drive shaft from the side plate, then roll it over the bounce plate and out the ball opening into the adjacent machine.
9. Wrap carpet around bounce plate and remove carpet and bounce plate together from machine. **NOTE:** The carpet should be run in the direction of the arrow stamped on the carpet. If no arrow is visible, mark the direction of rotation before removing the carpet from the machine.

CARPET REPLACEMENT PROCEDURE

1. Note arrow on carpet. Place bounce plate between carpet with "V" shaped cut-out toward ball exit. Wrap carpet around bounce plate and place in pit slightly forward on pit support brackets. Do not fasten bounce plate down at this time.
2. Replace rear roller using opposite procedure from removal.
3. Place rear roller bearings in bearing supports. Hook up rear roller support bracket and drive pulley and belts.
4. Place bounce plate in proper position on pit brackets and tighten four lock nuts.
5. Replace front roller in pit, but do not position in bearing supports yet.
6. The front roller can now be positioned. See page 4.4 for instructions.
7. Replace paddle on rudder arm.

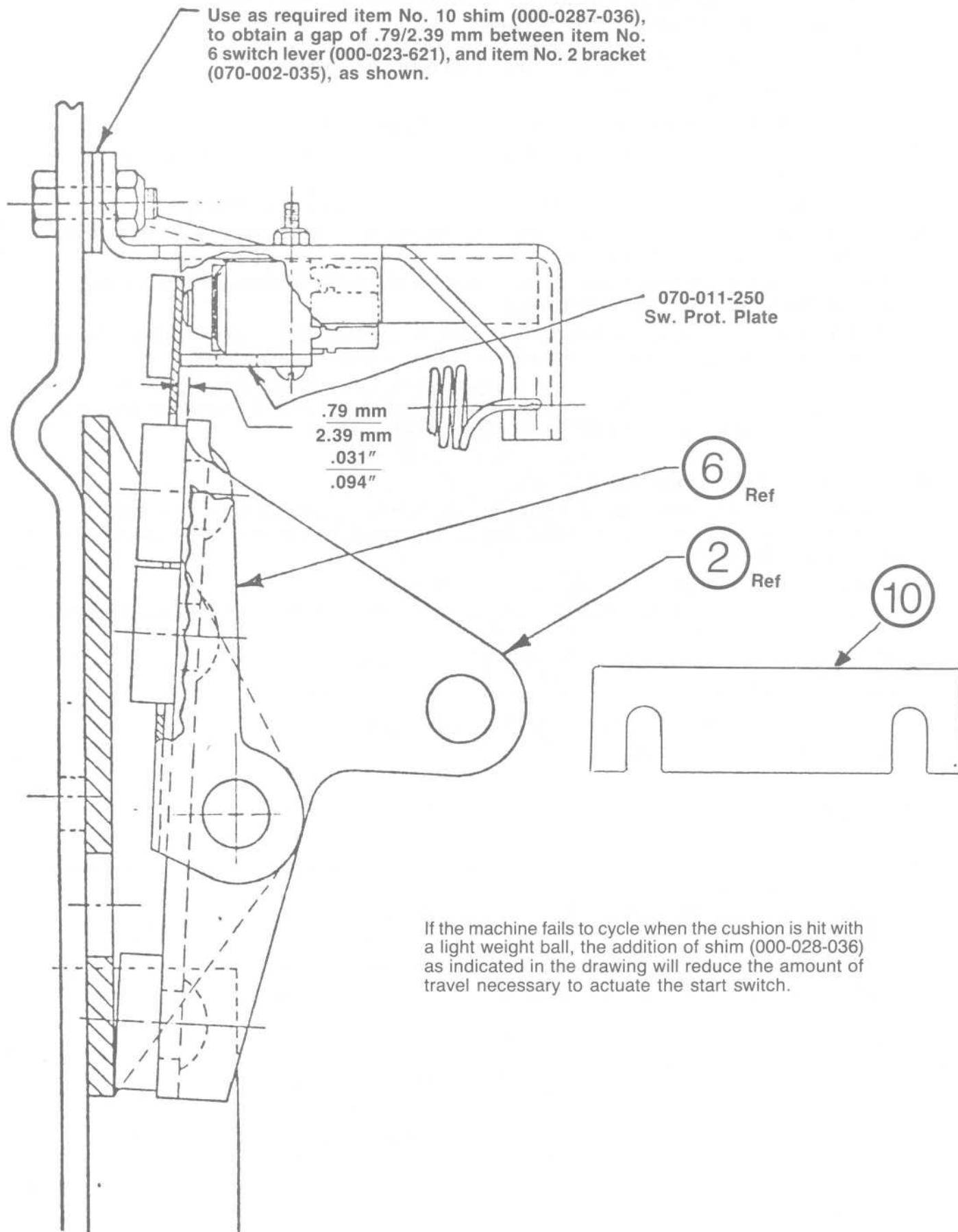
CUSHION REMOVAL

1. Unhook pin curtain.
2. Remove "X" washer 963 600 002 from pin 22821 and remove pin 22821 to release shock absorber from cushion assembly.
3. Remove three screws (Part #809 865 165) from Box 22788 holding mounting block. Remove from one side of machine only.
4. Wrap curtain around cushion and slide box and cushion assembly until cushion is free from mounting block on opposite side. Remove from machine.
5. To replace, reverse the above procedure.

NOTE: In order to replace a rubber rivet:

- a) Lubricate the raised portion of the stem of the rivet with liquid soap.
- b) Push rivet through cushion assembly until about 1" protrudes through the wooden plank.
- c) Use Carpet Installing Tool 784 003 000 and place the hole which is drilled in the tool over the end of the rubber rivet protruding through the wooden plank.
- d) Use a cranking motion to pull rivet through cushion.

ADJUSTMENT INSTRUCTION START SWITCH LEVER



82-70 / 90 Ball idling on the cushion

- When all attempts to eliminate a ball idling against the cushion fail and wear of all components is acceptable there still maybe a cure.
- When an 82-30 vertical lift is converted to a 45-degree lift, a spacer is used between the plank and the hanger weldment.
- The spacer is used only on the ball exit side of the cushion. It is an 82-30 part but can be used on a 70 and may solve the ball idling problem.
- The part number is 030-008-638. A longer bolt is required when using this spacer on an 82-70 machine.
- Part number 808-866-520. The original lower bolt is moved to the upper position.

PREVENTATIVE MAINTENANCE

The AMF Pinspotter requires a minimum of preventative maintenance to provide economical trouble-free operation. To provide the Proprietor's maintenance man with a form to be used to record this operation, the AMF Weekly Preventative Maintenance Chart has been formulated. This form also provides for a tabulation of parts replaced during the preventative maintenance operation so that the spare parts inventory can readily be maintained.

Page Reference

- 5.60 AMF Preventative Maintenance Chart
- 5.61 AMF Pinspotters Preventative Maintenance Check
- 5.63 Machine Protection During Lane Refinishing
- 5.63 Machine and Lane Cleaning

AMF WEEKLY PREVENTATIVE MAINTENANCE CHART

The weekly preventative maintenance is performed by the Proprietor's maintenance man using the form shown on page 5.61. Each machine is given this check once a week. For an example, the maintenance man of a 16 Lane House would do 4 machines per day for 4 days a week. See chart below.

Using the front of the form, the maintenance man will check the various assemblies listed and perform the details for each assembly as listed on the reverse side. The legend provides an easy simplified method of recording the type of action completed if necessary. If parts are replaced, part number should be entered into the "Parts Replaced" column. This information will supply the establishment with a perpetual inventory and facilitate the ordering of spare parts.

Overall cleaning and lubrication will be performed as per specifications as stated in the AMF Service Manual.

TYPICAL MACHINE INSPECTION SCHEDULE														
DAY	Number of Machines													
	6	8	10	12	14	16	18	20	22	24	26	28	30	32
MON.	2	2	2	4	4	4	4	4	5	5	6	6	6	8
TUES.	2	2	2	4	4	4	4	4	5	5	5	6	6	6
WED.	2	2	2	4	4	4	4	4	4	5	5	6	6	6
THUR.		2	2		2	4	4	4	4	5	5	5	6	6
FRI.			2				2	4	4	4	5	5	6	6

AMF PINSPOTTERS PREVENTATIVE MAINTENANCE CHECK

[illegible]

**THE FOLLOWING MAJOR MACHINE ASSEMBLIES SHOULD BE
CHECKED FOR PERFORMANCE AND CONDITION OF COMPONENTS.**

- 1. Sweep**
 - A. Sweep Drive Linkage
 - B. Sweep Stopping Positions
 - C. Condition and Operation of Sweep Bars
- 2. Distributor**
 - A. Driving Gears
 - B. Pin Delivery Positions
 - C. Shafts and Bearings
 - D. Drive Shaft and Universal
 - E. Conveyor Belts
- 3. Carpet and Pit Area**
 - A. Front Roller Actuating Linkage
 - B. Rear Roller and Drive Belt
 - C. Rollers, Bearings and Supports
 - D. Plows and Bounce Plate
 - E. Condition of Carpet Belt
- 4. Ball Exit**
 - A. Ball Exit Casting Assembly
 - B. Drive Belts
 - C. Lift Tube Assembly
- 5. Ball Lift**
 - A. Belt
 - B. Pulley Assemblies and Bearings
 - C. Elevator Track
 - D. Drive Belts—Clutches
- 6. Pin Elevator**
 - A. Pin Clamp Assembly
 - B. Ring Tube and Bearings
 - C. Pocket Inserts
 - D. Drive Belt
- 7. Cushion**
 - A. Ball Impact Pad
 - B. Screws and Fasteners
 - C. Shock Absorber
 - D. Cushion Curtain—Facing
 - E. Hangers—Supports
- 8. Table**
 - A. Spotting Pattern
 - B. Pin Cups
 - C. Respot Cells & Mechanisms
 - D. Drive—Supports—Linkage
 - E. Electrical Wiring
- 9. Motors—Drive**
 - A. Lubrication Level
- 10. Pit Signal—Pindicator**
 - A. Pin Lights
 - B. 1st and 2nd Ball
 - C. Strike and Foul
 - D. Signal Light—Bell—Reset
- 11. Counters—Frameter**
 - A. Mechanical Counter and Seals
 - B. Remote Counters at Managers Desk

MACHINE PROTECTION DURING LANE REFINISHING

During resurfacing or refinishing, dust particles and fumes from refinishing agent settle on operating parts of the machine and cause serious trouble after operation is resumed unless the following precautionary measures are observed.

REFINISHING

The purpose of this protection is to prevent the fumes from the refinishing agent from settling on exposed electrical contacts as the fumes will act as an insulator making the unit inoperative. Using masking tape or plastic wrap, seal all motor ventilating openings and cover and seal the chassis.

RESURFACING

In addition to the protection required for refinishing, it will be necessary to cover, with rag, common newspaper, or plastic, all open gearing, delicate assemblies, greased tracks, and operating surfaces to prevent the dust particles from clinging to these mechanisms ultimately causing mechanical binds. These points to be covered are back end solenoid and cam, right and left sweep drive gears and tracks, table spotting gear train, distributor head, and any other exposed parts that may have an oily or greasy surface.

After the resurfacing has been completed, all protection except on the motors and chassis, can be removed; and the entire machine must be wiped down with a damp cloth. After the refinishing process is completed AND THE BUILDING IS FREE FROM ALL FUMES FROM THE REFINISHING AGENT, the motor and chassis protection may be removed.

In order to permit the resurfacing machinery to extend further back into the pit area, the sweep assembly may be removed.

MACHINE AND LANE CLEANING

LANE CLEANING

For the daily lane cleaning, **the machine should be shut off** either at the machine safety switch on the masking unit or at the manager's control panel. The pins are then knocked into the pit with mop or broom. The lane is then ready for cleaning. After all the lanes have been cleaned, machines should be turned on and cycle buttons, or 10th frame switches, pressed in order to bring the machines ready for first ball.

If buffer or rotary brush is used, the hinged pindicator can be raised and propped in the "UP" position.

MACHINE CLEANING

The machine should be shut off and power plug removed before cleaning. The AMF Automatic Pinspotter must be kept clean at all times to give satisfactory service to the bowler. It is of utmost importance to start off with cleanliness and to maintain the cleaning schedule given below.

Every Two Weeks

1. Dust the complete machine.

Twice a Week

1. Wipe the following with a cloth dampened with Amflite pin cleaner:
 - (a) Inside of pin elevator wheel,
 - (b) Inside of spotting cups and bins,
 - (c) Pit carpet,
 - (d) Pin curtain face,
 - (e) Distributor belts and orientor,
 - (f) Ball lift vertical track,
 - (g) Sheaves and V-Belt drives.

2. Check motor drip pans and clean as required.
3. Reverse or change ball wipe cloths.
4. Vacuum between kickback plates and bottom section of ball lifts.
5. Vacuum under pin elevator wheel and carpet.
6. Clean ball lift belt.



**Remove Power Plug
When Working on Machine.**