

ON TARGET

Gottlieb

TECHNICAL NEWSLETTER

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POP BUMPERS

For dynamic and unpredictable playfield action, nothing can beat the pop bumper. It is the only playfield device providing ball contact about its entire periphery and guaranteeing sharp ball action. A player knows that a ball approaching a pop bumper means wild and exciting action. That is why pop bumpers must be maintained for optimum operation. Dead or dull pop bumpers spell disaster for the entire game.

Figure 1 shows a view of a complete pop bumper assembly. Figure 2 shows an exploded view of the pop bumper components. When a ball on the playfield depresses the bumper skirt, the cup blade configuration permits the bumper skirt stem to close the switch and actuate the circuitry necessary to energize the coil. A voltage pulse is applied to the coil, quickly pulling down the kicker ring that is attached to the coil plunger. The action kicks the ball out onto the playfield and closes the scoring switch contacts.

Replacing the kicking ring, bumper body, or bumper skirt requires the following steps:

1) After removing the

playfield glass, lift and secure the playfield with the playfield brace.

- 2) From the playfield bottom:
 - a) Unsolder the wires from the lamp socket terminals.
 - b) Unscrew the elastic stop nuts from the kicker ring tie rods.
(Use a 5/16"

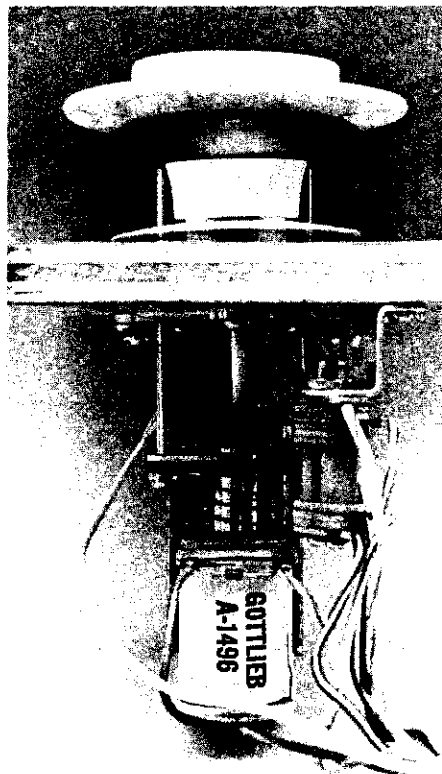


FIG. 1

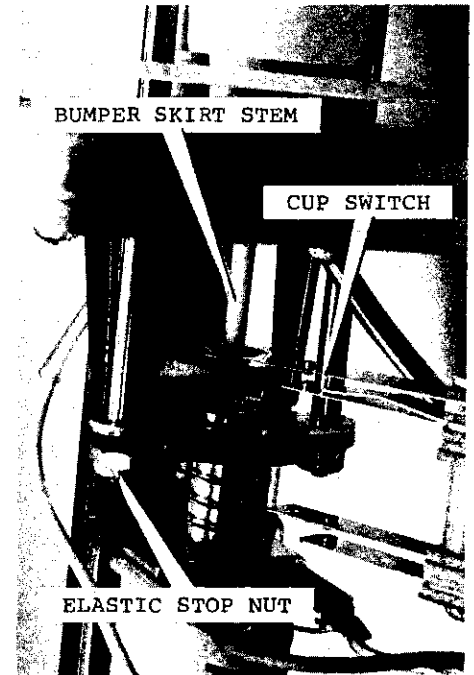


FIG. 1A,

- hex nut driver.)
- 3) From the playfield top:
 - a) Remove the pop bumper cap.
 - b) Remove the lamp.
 - c) Unscrew the two screws in the bumper body.
- 4) The complete top assembly can now be pulled away from the playfield.
- 5) Now pull the bumper base from the bumper body. Any component is now capable of being replaced.
- 6) Assembly is the reverse of the above procedure.

NOTE: To replace a lamp, follow Steps 3a and 3b.

(continued on p. 2)

POP BUMPERS

(continued from p. 1)

REPLACING THE COIL

- 1) Lift and secure the playfield with the playfield brace.
- 2) Remove the elastic stop nuts from the kicker ring tie rods.
- 3) Unscrew and remove the coil mounting bracket from the pop bumper pad and the kicker ring tie rods.
- 4) Unscrew the stop bracket from the coil mounting bracket.
- 5) Pull the whole assembly, consisting of the stop bracket, plunger, kicker return spring and yokes away from the coil. Keep this assembly intact.
- 6) The coil can now be removed from the coil mounting bracket.
- 7) Unsolder the wires from the bad coil, carefully noting how they are connected

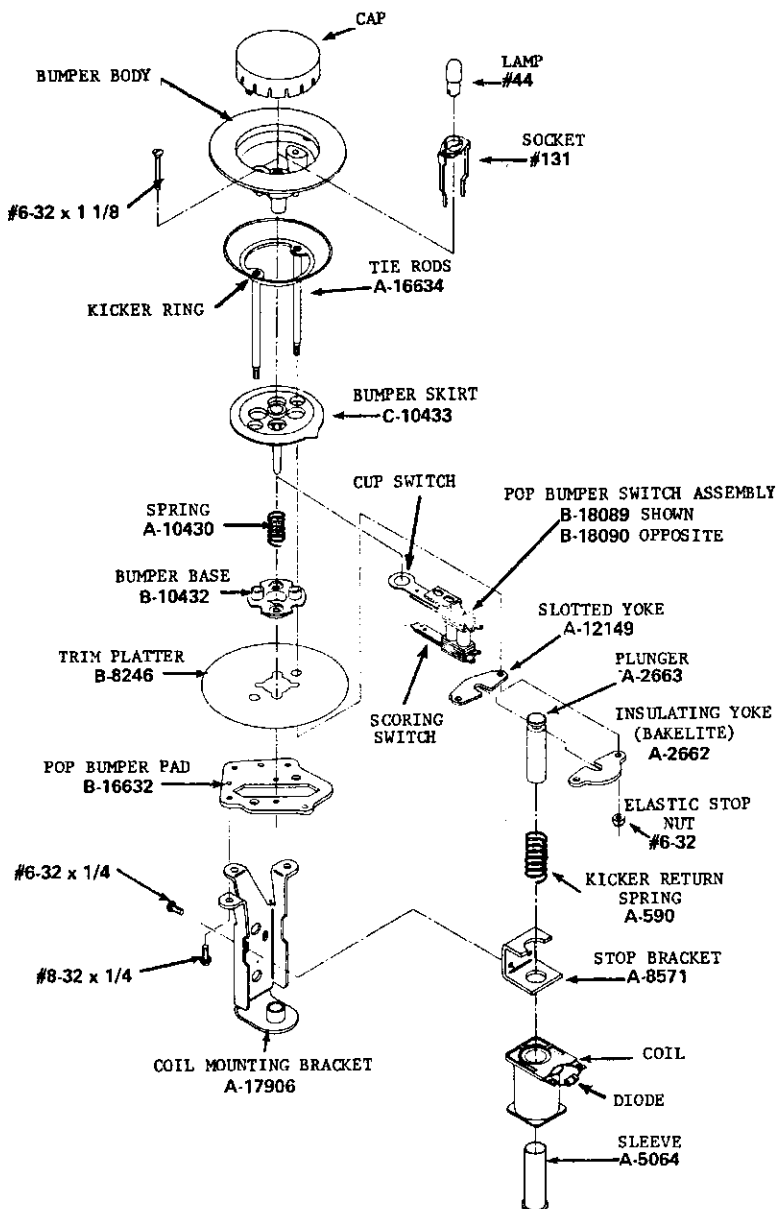


FIG. 2

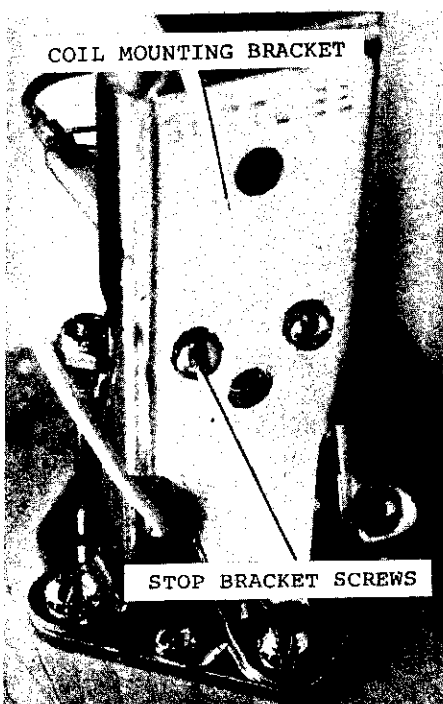


FIG. 1B,

- 8) Unsolder the diode.
- 9) Solder the diode, then the wires, to the new coil.
- 10) Assembly is the reverse of the above procedure.

SWITCH ADJUSTMENT

Proper cup switch alignment with the bumper skirt stem is necessary for consistent action around the pop bumper.

The bumper skirt stem should sit exactly in the cup switch center, lightly resting on the bottom of the cup.

To make this adjustment, loosen the switch mounting bracket screws. Adjust, then hold the switch mounting bracket firmly in place while retightening the screws.

The cup switch contact gap should be approximately 1/32". The score switch contact gap should be a 1/32" to 1/16" clearance with a 1/32" overtravel when closed.

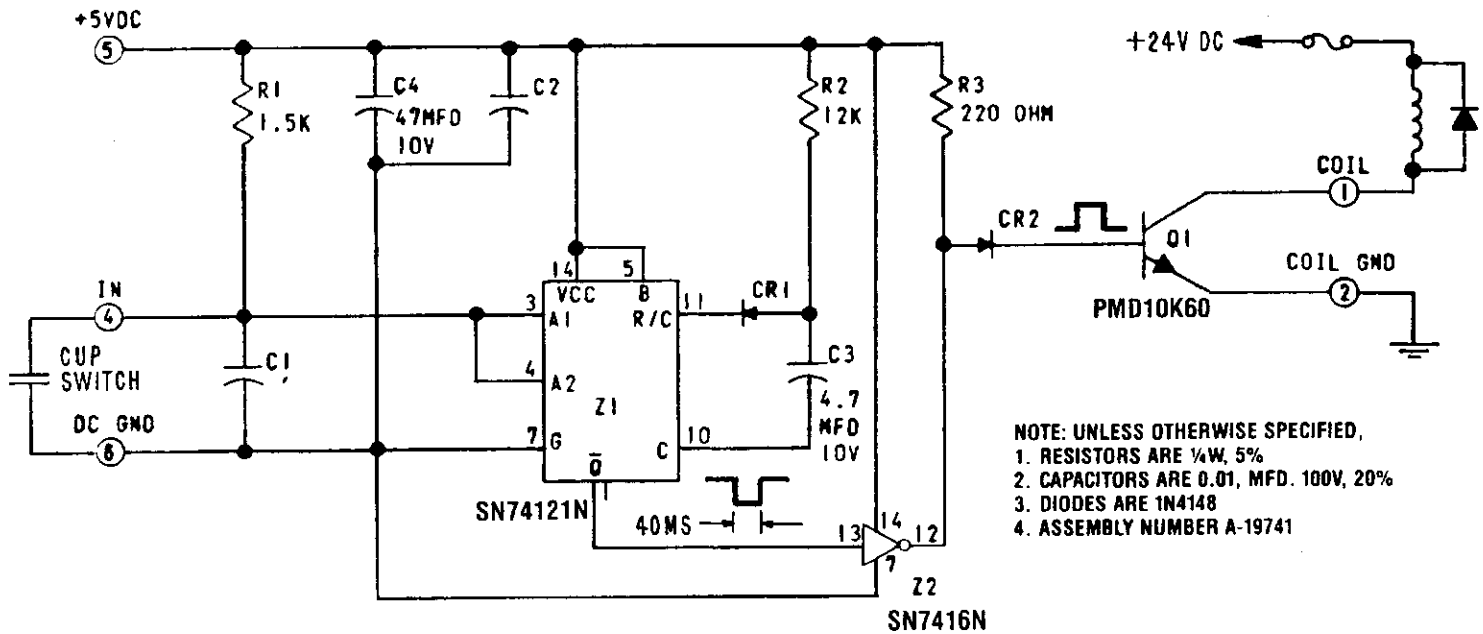
Pop Bumper Driver Board

Gottlieb uses a dedicated circuit board to activate a single pop bumper. The pop bumper driver board (located on the playfield underside) not only provides coil burn-out protection, but provides a constant pulse width to the coil during energizing. This guarantees a strong bumper kick, no matter how long or short a time the cup switch is closed. The driver board generates one pulse to the coil for each cup switch closure. This means that if the cup switch sticks closed, only one pulse will be sent to

the coil. The coil stays energized only for the duration of the pulse, thus eliminating coil burn-out due to shorted contacts.

A pop bumper driver board schematic is shown in Figure 3. When the cup switch closes, it sends a high-to-low-going pulse to the input of an SN74121 Schmitt Trigger (Z1). Z1 is activated and generates a pulse width dependent on the RC network of R2 and C3. Pin 1 (Q) of Z1 outputs a 40 millisecond negative-going pulse. The pulse is inverted through Z2, an

SN7416. Z2's output supplies the base of Q1 (PMD10K60) with a positive-going pulse. Q1 switches on and provides a ground to energize the coil. Q1 (PMD10K60) is an NPN Darlington transistor with a continuous collector current rating of 12 amps and a peak current rating of 20 amps. Total internal dissipation is 150 watts. An individual fuse (located on the playfield bottom) is wired in series with each pop bumper coil. Its rating is normally 2-2½ amps. The pop bumper coil is normally an A-1496.



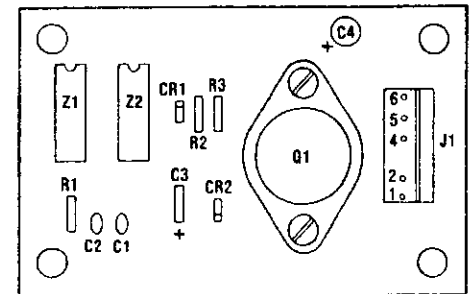
- NOTE: UNLESS OTHERWISE SPECIFIED,
 1. RESISTORS ARE ¼W, 5%
 2. CAPACITORS ARE 0.01, MFD. 100V, 20%
 3. DIODES ARE 1N4148
 4. ASSEMBLY NUMBER A-19741

FIG. 3

MISCELLANEOUS

The pop bumper lamp voltage is 6.3 VAC if the lamp is general illumination. At times, however, the lamp indicates increased

score value when turned on. In this case, it is controlled by a driver transistor and uses 6 VDC for lighting.



COMPONENT DIAGRAM

FLASHBACK

Since the debut of the flipper on HUMPTY DUMPTY in November 1947, Gottlieb has made only one non-flipper game. It was WATCH MY LINE, made in July 1951. The ball made a figure-8 path onto a playfield having

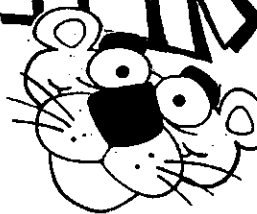
only holes and posts. Replays were given for both high scores and for lighting adjoining numbers on a backglass card. WATCH MY LINE was the closest Gottlieb ever came to a bingo game.

Next Month:

FLIPPERS: How they work and how to make repairs and adjustments.

COIL CHART: Lists all information needed to replace a Gottlieb coil in the field.

PINK PANTHER



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of our new
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