IGNITION AND FUEL SYSTEMS
Diagnosis and Testing
See Index Page 2 For Other Timely Articles
INTRODUCTION

This is the second in a series of articles presented to help service personnel quickly trouble-shoot engine problems by using a systematic diagnosis procedure. Last month, the Battery, Charging and Starting Systems, which usually cause "no-cranking" or "slow-cranking" problems, were covered. If the engine cranks normally, but fails to start, chances are the ignition or fuel system is at fault. The ignition system will be covered first, then the fuel system.

IGNITION SYSTEM

Generally, two main types of ignition problems are encountered. One, is poor performance. This indicates a major tune-up is required, using a scope or similar detailed testing equipment. (This will be covered in the next issue of Shop Tips). At this time, only quick tests that indicate defects or deficiencies which might cause the second type of ignition problem hard-starting, will be covered. In some cases the quick tests will also find and help correct poor performance problems, but they are not primarily intended for this purpose.

The function of the ignition system is to ignite the combustible air-fuel mixture under pressure in each cylinder at just the right moment to produce the most efficient engine operation. Under normal operating conditions, the ignition system must perform its job about 10,000 times every mile; by forcing a surge of electricity to jump a spark plug gap. This requires 15,000 to 20,000 volts. Considering that the source of electrical power is only 12 volts, and the exacting timing requirements, it is easy to see that all specifications and adjustments must be accurately maintained.

FORD ignition systems are precision engineered to give long trouble-free operation. However, a certain amount of wear is unavoidable; so to maintain engine efficiency and performance at high levels, periodic service is necessary. If this service is ignored, or low quality replacement parts used, then performance and/or starting problems are likely to develop. Much time can be saved when trouble-shooting starting problems, and "come backs" avoided, if the following information is used, together with the step by step diagnosis procedures.

COMPONENTS (Conventional System)

The major components of the conventional ignition system are: the battery, ignition switch, ignition coil, distributor, spark plugs and wiring. They are arranged in a low voltage and a high voltage circuit; and connected together by the ignition coil.

The low voltage or PRIMARY CIRCUIT consists of:
- Battery
- Ignition Switch
- Primary circuit resistance wire
- Breaker Points (Distributor)
- Condenser (Distributor)
- Primary windings of the ignition coil

The high voltage or SECONDARY CIRCUIT consists of:
- Secondary windings in the ignition coil
- Rotor (Distributor)
- Distributor cap
- High Tension (Voltage) wires
- Spark Plugs
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DEARBORN, MICHIGAN
All Ford cars use a centrifugal, single dry disc type clutch. The principal components are the clutch disc, pressure plate and release bearing. The clutch is operated by linkage which must be properly adjusted and free of any conditions which might cause binding or excessive force to apply. The transmission, pressure plate, housing, clutch disc, flywheel and crankshaft must be properly aligned to prevent slippage, vibrations and noise. Ordinarily, the clutch does not require periodic service unless one of the trouble symptoms in the Diagnosis Guide is encountered.

RELEASE BEARING

Wipe all oil and dirt off the release bearing. THE BEARING IS PRE-LUBRICATED AND SHOULD NOT BE CLEANED WITH SOLVENT.

Inspect the bearing retainer for loose spring clips and rivets.

Inspect the release bearing assembly for burrs which may cause the assembly to drag on the transmission bearing retainer. Any such burrs should be cleaned up with fine crocus cloth. If burrs are found, inspect the transmission input shaft bearing retainer for evidence of scoring. Scoring should be polished out with crocus cloth. Coat the bearing retainer with a thin film of lithium-base grease (Ford Part Number C1AZ-19590-B). Prior to release bearing installation, apply a light film of Lubriplate on both sides of the release lever fork where it contacts the release bearing hub and retaining springs, and to the release bearing surface that contacts the pressure plate fingers. Care must be taken to avoid contaminating the clutch disc with any lubricants as this will cause slippage, and chattering.

Check the release bearing for roughness or noise by holding the bearing inner race and rotating the outer race while applying pressure. If rough or noisy, replace the bearing.

Most release bearing failures are caused by improper clutch pedal adjustments. If the clutch linkage does not have enough free travel, the release bearing will constantly touch the release fingers and will spin whenever the engine is running.

PRESSURE PLATE AND COVER

Inspect the surface of the pressure plate for burn marks, scoring or ridges. Generally, pressure plate resurfacing is not recommended. However, minor burn marks, scores or ridges may be removed if the flatness of the pressure plate is maintained. If the pressure plate is badly heat-checked or deeply scored, replace the pressure plate and cover assembly.

Clean the pressure plate surfaces with a suitable solvent such as carbon tetrachloride, to be sure they are free of oil film. DO NOT USE CLEANERS WITH PETROLEUM BASE AND DO NOT IMMERSE THE PRESSURE PLATE IN THE SOLVENT.
Lay the plate on the floor, being careful not to score or scratch the surface, and force each individual finger down, then release quickly. If the finger does not return quickly, a binding condition is indicated and the pressure plate should be replaced.

Lubricate the pressure plate with lithium-base grease between the driving lugs and the edges of the pressure plate openings as shown in Figure 2. Depress the pressure plate fingers fully, apply the lubricant, and then move the fingers up and down until the lubricant is worked in. DO NOT APPLY EXCESSIVE AMOUNTS OF LUBRICANT.

**DIAGNOSIS GUIDE—CLUTCH**

<table>
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<tr>
<th>TROUBLE SYMPTOMS</th>
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| LOSS OF OR EXCESSIVE CLUTCH PEDAL FREE PLAY AND/OR INADEQUATE RESERVE | 1. Clutch linkage out of adjustment.  
2. Worn clutch disc.  
3. Bent or cracked equalizer bar. | 1. Adjust clutch linkage.  
2-3. Replace worn or defective parts. |
| CLUTCH PEDAL HANG UP OR EXCESSIVE CLUTCH PEDAL EFFORT | 1. Incorrect assist spring over center adjustment.  
2. Assist spring not positioned properly.  
3. Binding at pedal support bracket, or equalizer rod at firewall. | 1. Adjust over center spring and clutch total travel.  
2. Install correctly.  
3. Lubricate with engine oil or replace support bracket bushing if defective. |
| RELEASE BEARING                                    | 1. Lack of lube on transmission input shaft bearing retainer.   | 1. Clean and lubricate retainer with thin coat of Lithium base grease (no Polyethylene). |
| CLUTCH NOISY WHEN PEDAL FREE TRAVEL IS TAKEN OUT, ENGINE RUNNING | 1. Release bearing failure due to:  
A. Improper travel adjustment.  
B. Bearing cocked on hub.  
C. Release lever out of plane.  
D. Flywheel housing misalignment.  
E. Excessive crankshaft end play. | 1. Correct release bearing.  
A. Adjust travel to specification.  
B. Install correctly.  
C. Check fulcrum plate and return spring. Install correctly.  
D. Align to specification.  
E. Repair to specifications. |
| CLUTCH NOISY WITH ENGINE OFF                        | 1. Insufficient lubricant on assist spring seats.  
2. Clutch assist spring clunking.  
3. Binding at pedal support bracket or equalizer rod at firewall. | 1. Lubricant linkage and/or spring seats.  
2. Lubricant spring ends.  
3. Lubricate with engine oil or replace support bracket bushing if defective. |
| CLUTCH SLIPS OR CHATTERS                            | 1. Incorrect pedal free travel.  
2. Worn or contaminated clutch lining.  
3. Grease or oil on clutch facings from:  
A. Release bearing.  
B. Engine.  
C. Release lever.  
D. Pilot bearing.  
E. Transmission. | 1. Adjust travel to specification.  
2-3. Replace defective parts. (If grease or oil is causing the clutch to slip, replace the disc. Remove the grease or oil from the pressure plate and re-use if it is not burned or scored). |
| THUD                                               | 1. Excessive engine crankshaft end play. | 1. Repair to specification. |
| CLUTCH PEDAL SCRUBBING—ENGINE OFF                   | 1. Pedal push rod rubbing on firewall felt and insulator.  
2. Pedal shaft binding at support bracket.  
3. Lack of lube on transmission input shaft bearing retainer. | 1. Lubricate and check clearance.  
2. Lubricate with engine oil or replace support bracket bushing if defective.  
3. Clean and lubricate retainer with a thin coat of Lithium base grease (no Polyethylene). |
Lay the plate on the floor, being careful not to score or scratch the surface, and force each individual finger down, then release quickly. If the finger does not return quickly, a binding condition is indicated and the pressure plate should be replaced. Lubricate the pressure plate with lithium-base grease between the driving lugs and the edges of the pressure plate openings as shown in Figure 2. Depress the pressure plate fingers fully, apply the lubricant, and then move the fingers up and down until the lubricant is worked in. DO NOT APPLY EXCESSIVE AMOUNTS OF LUBRICANT.

Figure 2—Pressure Plate Lubrication Points

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