

Front end over

A MOTORCYCLE FRONT END HAS TO do many different things. The most obvious is to steer the bike but it also has to absorb cornering forces, keeping your tyres in contact with the road. And while it's doing all this, there's the small matter of soaking up the bumps and potholes which cover our roads.

Although the outward appearance and size of motorcycle front ends has changed over the

years, the internal mechanism is basically the same in a modern Honda Blackbird and Fifties Norton Dominator. The steering head moves on bearings and holds forks containing coil springs allowing them to compress and absorb bumps, braking and cornering forces. Spring compression and rate of return is controlled by oil flowing through a damper which stops the suspension behaving like a pogo stick.

What goes wrong

Steering head bearings wear which affects the precision with which a bike can

change direction. Most older bikes have ball and race type (or cup and cone) fitted as standard. The only problem with ball bearings is that they have a relatively small contact patch on their races which accelerates wear on the races. Wear is usually worse at the front and back of the races from acceleration and braking.

They are also expensive and fiddly to replace so most people favour taper roller bearings which generally last longer, as the force and wear is spread over a much larger surface area. Fortunately most motorcycles originally fitted with the ball and race type

can be fitted with the less expensive taper bearings.

A small change to the fork oil viscosity or volume can make a big difference to the damping performance. Fork oil oxidises with time and use reducing the viscosity and the forks' efficiency allowing them to top or bottom out.

Fork springs wear but it usually takes upwards of 15,000 miles before you can detect any serious problems. They can also break or twist but this is usually down to a metallurgic failure rather than excessive use (unless you regularly take your Bonnie scrambling).

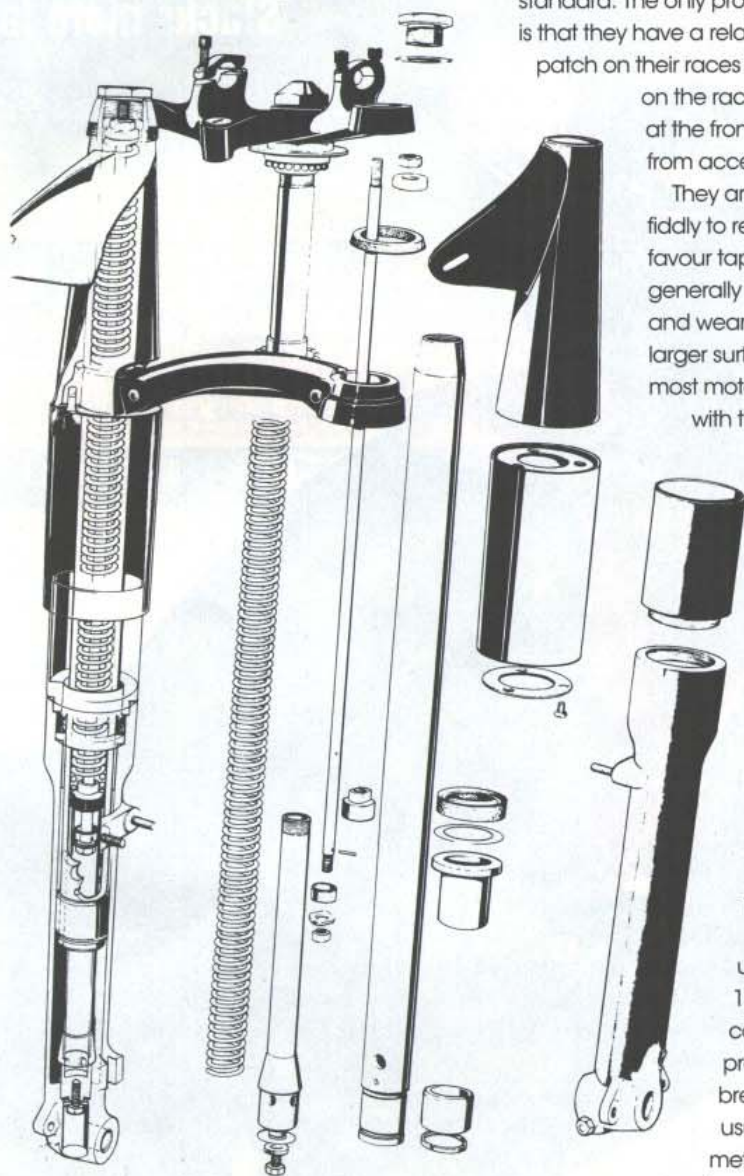


Diagram of 1966 Norton Roadholder forks shows the basic method of operation still used by most modern bikes

Steering stem and yoke



Before starting work on the front end, the front wheel needs to be safely off the floor. Our Yamaha XS650, has the luxury of a centre stand, but as the bike is front heavy, we have blocked up the engine cradles with wood, to prevent overbalancing. ① To gain access to the steering head bearings it is necessary to dismantle the entire front

Keeping your steering and front suspension in top condition is essential to get the best from your bike. **Julian Button** shows you how
pics John Noble/Martyn Barnwell

e removal



end. Remember to keep the brake master cylinder upright, so air doesn't get into the brakes. **2** The top yoke can be removed complete with the handlebars by undoing the pinch bolt and steering adjusting bolt. **3** The top bearing lock nut can now be undone using a drift and then unwound by hand. Be sure to support the bottom yoke

with the other hand, **4** otherwise the yoke and the bearings will drop out. The top bearing race and bearings can now be removed and the bottom yoke put to one side for later examination. **5** A close inspection of the top bearing lower race reveals damage especially in the lower half - unusual for a bike showing only 7000 miles but not that uncommon for a Seventies Jap. **6** The races that are held in the upper and lower headstock can be removed easily using a hammer and drift. The races need to be knocked out squarely, so that the headstock surface isn't damaged. **7** When removing the lower race make sure there is enough of a lip to site the drift and be careful when using force on any bearing surface as the bearing can shatter, so always wear eye protection.

Use brake cleaner or contact cleaner to prepare the bottom yoke and steering stem for the new taper bearings. **8** The bearings can now be pushed over the stem until they meet the bearing lip. Due to the tight fit of the bearings the easiest way to fit them properly is by using a vice. With the jaws held just wider than the steering stem, the bearing inner surface should be set against the vice jaws. By tapping the middle of the bottom yoke gently the bearing should go on squarely. You should not use a drift or a socket on the bearing cage, as it can easily be damaged.

9 The races for the taper bearings can be knocked into the headstock using a flat-ended drift and hammer. **10** Both pairs of bearings now require greasing liberally with good quality grease, before the lower yoke is pushed up into the headstock. The upper bearing, its cover, adjusting nut and locking nut can now be fitted.

11 To settle the bearings in; tighten the adjuster nut and then 'shock' the bearings by tapping the centre of the bottom yoke with a hammer. This should push the taper gradually into the headstock. The adjuster nut will now need to be re-tightened. Keep adjusting and shocking until the adjuster nut won't tighten anymore. ▶

Steering stem and yoke assembly

◁ The steering stem will now move notchily in the headstock so loosen off the adjuster nut until the steering moves freely again and retighten the adjuster until the yokes have resistance but still move fairly freely. The upper lock nut should now be tightened against the adjuster nut. The top yoke can now be placed on the steering stem ready for the forks to be replaced.

When refitting roller bearings, pack them in grease to keep them in place and take care when first adjusting them. They will need readjusting soon after refitting.



Dismantling the forks



1 Remove the dust cover, the circlip and flat washer. 2 Remove the stanchion cap bolt and invert the fork to remove the spring 3 and drain the old oil. Removing the damper rod either needs a compressor and



air driver to remove the retaining bolt or a special tool. Without this the damper will spin round in the fork leg. A sharpened broom handle inside the leg can hold the bolt in place but this often doesn't work.

Examination

1 Inspect the forks for pitting, scoring and damage to the chrome on the fork stanchion. The forks can be checked for straightness by either rolling them on a flat surface or holding them up together against a light source.

Inspect the spring for damage, and measure the free length against the manufacturer's specifications. Springs deteriorate with use rather than age so don't assume they need replacing just because they're old.

Most spring suppliers can either supply exact replacements or more sophisticated dual rate or 'progressive' springs which have a soft initial travel to soak up bumps but stronger final springing to stop the forks bottoming out.

The threads on the damper rod end are sometimes contaminated with Ny-loc material which can be cleaned out using the Allen bolt and contact cleaner.

Reassembly



Maintaining your front

Most front end problems can be avoided if you look after your bike. One of the biggest problems is pitting on the fork stanchions which is usually caused by physical damage (such as a stone chip) damaging the chrome. A small amount of damage will let water get under the chrome which will then start to bubble and peel off. Prevent this by cleaning the forks regularly with a non abrasive cleaner. Check that the circlip under the dust cover is lightly greased, rust makes it hard to remove. Save seals by cleaning dead flies from stanchions quickly.

If the seals are leaking oil, replace them as soon as possible. Not only will the oil ruin brake

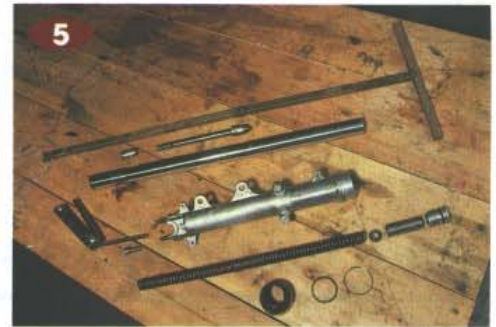




3 If you don't have access to a compressor most bike shops will undo the bolt for a couple of quid. Once undone, the damper rod can be removed and the fork stanchion pulled free from the bottom leg. **4** Prise out



the seal with a pry bar or screwdriver. The leg can now be cleaned out using brake or contact cleaner. If the seal housing is lightly damaged, it can be cleaned up using fine wet and dry paper to remove any scoring



that will prevent the seal seating correctly. **5** With the fork legs now completely stripped, they can be cleaned, using a non-abrasive solvent, such as brake or contact cleaner, and inspected before reassembly.



1 Place the new seal in the fork leg by knocking it into place using a large socket that covers just the seal, but sits comfortably into the lower leg. If you don't have access to such a large socket, the old seal with its outer rubber coating can be used to drift the new seal into place. Refit the circlip and washer over the new seal.

2 The damper rod and spring can now be refitted to the stanchion ready to be put back into the fork leg. You can ensure the



damper rod sits correctly by looking through the Allen bolt hole and aligning the rod to the bottom of the fork leg with a small screwdriver. Before re-tightening the Allen bolt make sure the copper washer is in place, to ensure a good seal. Replace the spring and spacer. **3** The forks can now be pushed carefully back through the lower and upper yokes.

With both fork legs replaced onto the bike, the forks and yokes can be checked for



alignment, before tightening the pinch bolts to the correct torque settings shown in the manual. **4** Use a measuring cylinder to ensure the right amount of oil of the correct viscosity is poured, using a funnel, into the fork stanchion before replacing the fork cap. The upper yoke bolt and the pinch bolt can now be tightened up.

5 The front wheel, brakes, mudguard and switchgear can now be put back onto the motorcycle.

end

pads, but as it leaks away it will affect your bike's handling and put extra stress on the other fork components.

The fork oil should be changed periodically, as it deteriorates with temperature (a working fork gets surprisingly hot), oxidation and use. Modern oils are multigrade even if their weight is quoted as a single. Traditionalists use automatic transmission fluid (ATF) but a modern fork oil performs better and maintains its performance for longer.

Steering head bearings need regular greasing and adjustment depending on use. When replacing, bearing supplier are often cheaper but most can't supply motorcycle taper rollers.



This peeling chrome probably started out as a tiny stone chip but moisture gets in and peels the chrome away from beneath

Improvements

Norton specialist Mick Hemmings acknowledges the benefits of taper roller bearings but warns, "Taper rollers need more frequent adjustment than cup and cone and are harder to adjust with precision."

Les Emery of the Norvil Motorcycle Company adds, "The extra height of taper rollers can affect the fit of headlamp brackets."

Damaged forks can be straightened or rechromed but check the cost of replacements first. They're available for most popular bikes and are often cheaper than a repair. Norvil Motorcycles do a complete Roadholder kit minus sliders for £98.70.

Steering head adjustment

Steering head bearings should be always be kept well adjusted. Notchy or awkward steering is usually caused by overtight bearings. Clonks when braking or unexplained handlebar wobbles are the result of loose bearings. With the front wheel off the ground nudge the bars

from side to side. They should move freely. If not, the bearings are too tight. To check if the bearings are too loose, pull the forks back and forth against the headstock. Any movement indicates loose bearings. Time taken adjusting the bearings carefully will

ensure your bike handles beautifully. With the front end now completely assembled the forks need to be primed, pumping the forks up and down five or six times can do this. Further adjustment may be needed in the next few weeks as the bearings bed in.

What about more serious damage?



Frank Poulton of Hard Chrome Plating and Grinding (HCP&G) has been repairing forks for 15 years. He claims to be able to repair almost any damage. It costs around £120 a pair to repair and turnaround is ten days.

Frank takes us through his fork repair procedure

The legs are inspected visually to assess the damage. Creased forks are generally not repaired, because this weakens the steel.

1 The fork is placed on a flypress to straighten it, and then checked using a dial test indicator **2** to find any high or low spots before going back to the flypress. **3** All the existing chrome, pits and scores are removed by a grinding machine to leave the original bare steel.

4 The forks are polished to give a surface ready to chrome.

5 Prior to chroming blue tape is applied, which acts as an insulator on the areas that aren't being chromed. This tape is covered with a conductive silver tape to allow current flow over the surface. Note the 'robbers' placed in the ends of the stanchion which rob current from the hot spots at the stanchion ends and prevent burning.

6 The forks are placed into a bath containing a chrome-based solution. A large current (approx. 2000 amps) but only 8 volts, is passed along the fork, which attracts the chrome from the solution and deposits it to a maximum depth of 0.07in. The forks are removed after 5-6 hours; to be reground and polished **7**. The forks are then inspected for

imperfections **8** and the diameter checked with a micrometer.

Thanks to

M&P, (Swansea) 08705 703030 huge stocks of head bearings and fork seals for all bikes
Motolink (Lincs) 01526 344443 Yamaha spares specialists for help and advice
Frank Poulton HCP & G (Notts) 01623 862314