HOT AIR!

Some People Are Full Of It, Balloons Fly With It And Yamaha Uses It In Place Of Springs

TEXT AND PHOTOS BY WALT FULTON

When the first motorcycle appeared nearly a century ago, it was nothing more than two wheels and a simple internal combustion engine suspended in a rigid wood frame. Because of speeds attainable at that time (5-15 mph), a lack of suspension wasn't of any consequence. As the sport progressed riders and designers alike strived for and wanted more comfort. If the motorcycle was to be accepted as a means of transportation, it had to be easier on the posterior. Also, competition was a sideline of the industry and as racers and tuners worked for more speed it became necessary to build better-handling bikes. This went hand-in-hand with the comfort requirement: a suspension system would solve both.

The front of the bike was the first to receive the "shock" treatment. The manufacturers of the day accomplished this springing in a variety of ways, including girder forks, leading link, Earls-type and even a rubber band suspension used on some lightweights not too many years ago. All of these have fallen by the wayside and have been replaced by the telescopic fork; *it* has endured the test of time, performance and appearance appeal of the masses. The changes these forks have undergone since the Thirties is minimal: a spring is still used to cushion the compression damping and oil controls the extension.

Even so, improvements in the front end paved the way for shocks on the rear. From the limited travel of the spring hub to the three to four inches of movement of the present-day conventional system and the long-travel shocks, great strides have been made in taming the rear end. Yamaha was the first to make perhaps the biggest breakthrough in rear suspension, the monoshock. Once again Yamaha goes to the head of the class with the introduction of the first OEM-available air forks. They weren't the first to have a shot at these forks, but were the first to see the potential and put it to work for them.

These two-stage air forks, built by Kayabe (Red Wing in this country), have been subjected to a rigorous test program at Yamaha for the past eight months. Perhaps some of you will recall seeing two containers on the tops of Jammin' Jimmy's forks last season. These canisters didn't contain go-fast juice but compressed air. After a season on the circuit and many hard miles on various sized bikes, the air fork was released to the public by Yamaha on the YZs.

Unlike last year's spring fork, the piston on the air units cannot be modified (at least not without a great deal of effort). The piston is no longer held in place by a snap ring, but is secured inside the stanchion by rolling the edge of the stanchion over. The edge can be ground off and the piston removed; to replace it the tube must be welded. Fortunately, the three different adjustment ranges on the forks make this unnecessary.

The most obvious difference in these forks is the lack of springs to control the compression damping. It is regulated by the amount of air in the low- and high-pressure chambers. The low-pressure chambers are the fork sliders and the high-pressure chambers the two canisters on top of the fork tubes. Air in these two chambers takes the place of a conventional progressive spring. The low-pressure chamber absorbs the small ripples and the high-pressure chamber handles the larger ones.

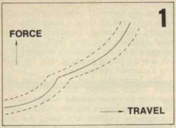
A change of pressure in the lower chamber will affect compression damping throughout the entire range of the fork. On the other hand, varying pressure in the high-pressure chamber doesn't alter the performance characteristic of the first stage. Graphs one and two point this out. As indicated, the ride and travel can be adjusted to suit any rider on any track.

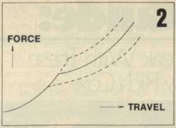
The third graph deals with a capacity change of oil in the sliders while the air pressure in the chamber remains constant. Less oil equals more volume the air must fill. This means a softer progression as the forks are compressed. When the air space is decreased (more oil added) the ride becomes firmer, quicker.

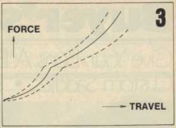
Different viscosities of oil can be used, but the net effect is the same as with conventional forks. Both compression and rebound damping are altered by the same factor. Yamaha recommends 10W in the 250 and 400 and 20W in the 125.

Yamaha has available an Air Fork Servicing Tool, part No. ACC 110800140; the retail price is $30. This is a must for the serious rider. The kit includes everything needed to fill and adjust pressure in the forks except an air bottle. Prices of a bottle vary, but shouldn't cost more than $10 with a gauge. Without the kit the forks can be filled with a manual pump provided it uses a snap-on fitting. Otherwise too much air will be lost when the hose is unscrewed from the valve in each chamber.

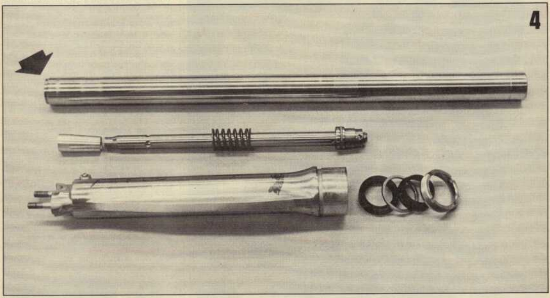
As with anything new and complicated there are advantages and disadvantages. Increased oil capacity ensures no loss of damping from heat build-up. The three different adjustments necessary to tune these forks for a rider and track may throw the average individual off for a while, but with a little practice and trial-and-error these forks can be dialed-in in no time flat. Before any proper adjustments can be made it is a must that a rider know what he or she wants and fully understands how to arrive at that point.

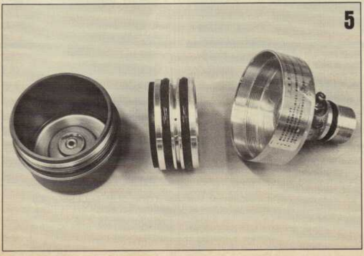






1 Varying the pressure in the lower chamber will affect the operation of the forks through out their entire travel. Notice that this difference in pressure not only changes the rate, but the progression of travel in this stage as well. An increase or drop in lower chamber pressure also determines how far the forks travel before the high pressure chamber piston begins to move.
2 When a change is made in the high pressure chamber the performance of the low pressure side remains unchanged, except for the transition point between the two stages. The rate and progression vary in the high pressure stage only.
3 The last variable is the volume of air in the lower chamber, it is adjusted by the quantity of oil in the fork leg. This adjustment changes rate and progression in both high and low pressure chambers.
NOTE: The solid black line in each of these three graphs represent a normal setting, the broken lines indicate a higher or lower air pressure. In graph three they indicate more or less volume of air at a constant pressure.





4 The dissected lower chamber. The piston is in the fork tube (arrow), the spring on the damper rod is to prevent topping. The two seals retain damping oil and air pressure. The ridged aluminum sliders on the 125 are 10% lighter than previous ones.
5 Three pieces make up the high pressure chamber: the chamber itself, piston and chamber cap. The two "O" rings on the piston separate the high and low pressure sides of the fork. The holes between the "O" rings pass oil to lubricate the cylinder wall and seals. The rubber donut on top of the piston acts as a buffer between piston and cap.