design/technology

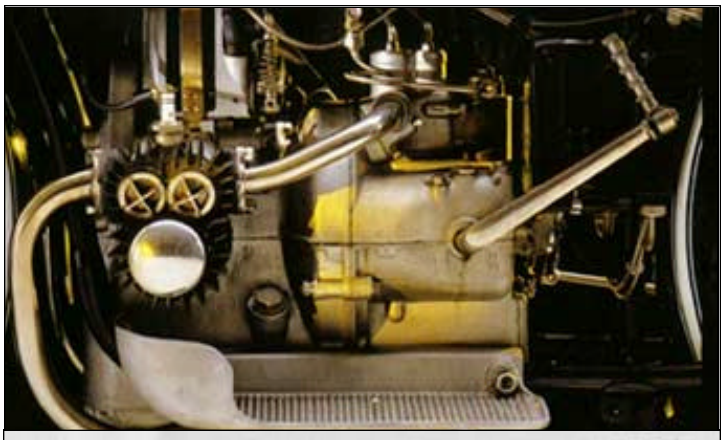
Motorcycles

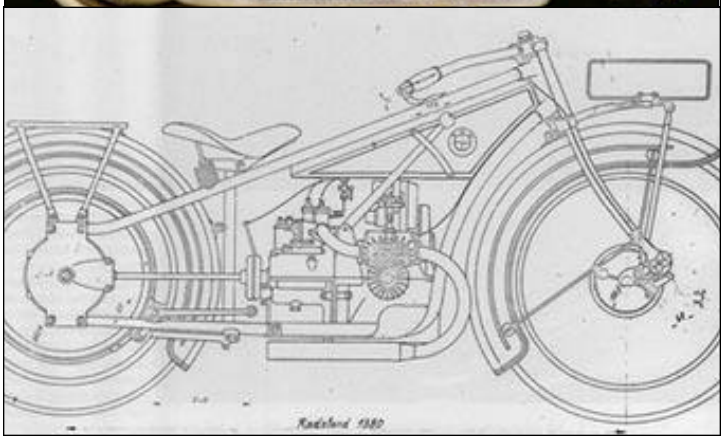
design/technology

1921-23

The First Boxer Engine

Named the M2B15, but better known as the 'flat-twin' or 'boxer,' BMW's trademark engine was designed by Max Friz. It was the defining component of BMW motorcycles until the introduction of the K-series in 1983. With the help of designer Martin Stolle, the M2B15 engine was used in motorcycle production for such brands as Victoria, Corona and Scheid. This first boxer engine (so knick-named because the pistons worked in opposite directions much like a boxer's fighting arms) was a horizontally opposed 500cc air-cooled twin cylinder that could develop 6BHP of power. Also known as a Bayern-Kleinmotor (Bavarian Small Motor), the boxer had three unique innovations that would remain throughout its years in development:The engine design included transversely mounted cylinders, which were cooled by exposure to the passing air.The gearbox and engine formed a single unit that was driven by a horizontal crank-shaftA drive shaft replaced a chain and sprocket drive and had a straight torque path to the rear wheel.The second version of the boxer engine, model number M2B32, was released in 1923 on BMWs first serious contribution to world motorcycling, the R32. Friz refined the twin's performance with the M2B32 and it would now achieve 8.5BHP at 3300rpm and could carry the motorcycle to a top speed of 60mph.





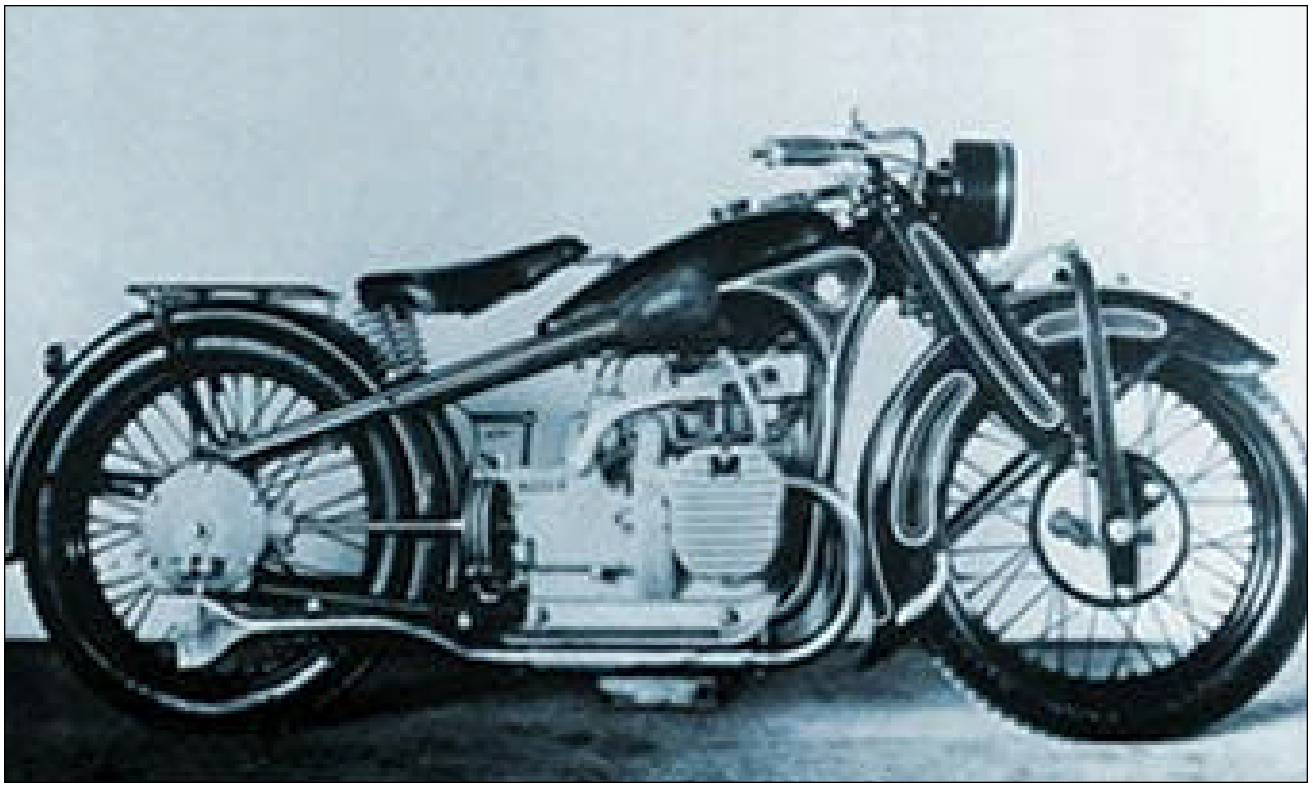
Motorcycles

design/technology

1929-36

The Pressed Steel 'Star' Frame

BMW took a temporary departure from the conventional tubular frame with the pressed steel "star" frame. The name "star" may come from the German word "stark" which means strong. This pressed steel frame was incorporated into motorcycle design back in the industry's infancy. One possible reason for the switch was economic necessity. However, a more practical reason may be that at the time, the 24BHP engine of the R36 might have put too much stress on the tubular frames of the time. The Achilles heel of tube was the attachment of the rear drive housing by two bolts. This bolts compromised the strength of the frames possibly causing them to yield under higher stress. The alternative pressed steel frame encircled the rear drive providing added rigidity to the once weak spot. BMW ultimately returned to the tubular style frames in 1936, never offering a pressed steel frame to the public again.



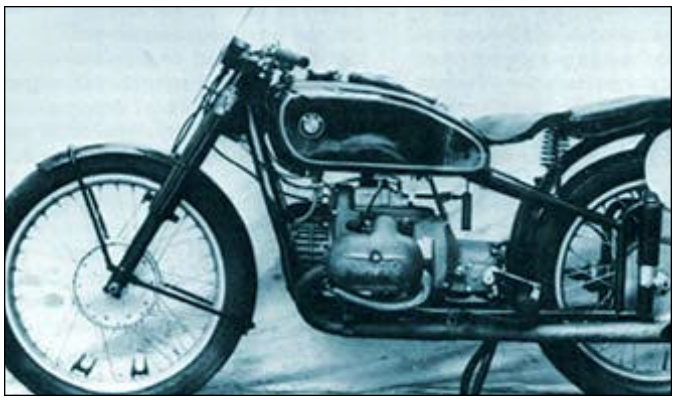
Motorcycles

design/technology

1935

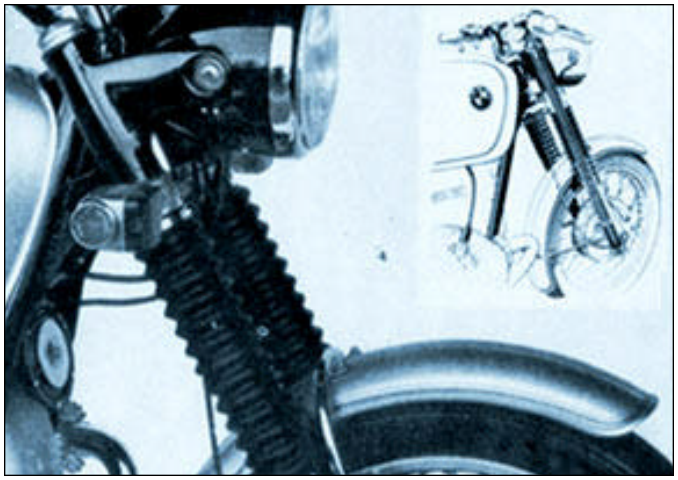
The Model 255 Kompressor

As the first supercharged motorcycle BMW made from the ground up (as opposed to modifying existing models), the Kompressor went on to turn heads and win races adding to BMWs reputation as a serious performance motorcycle manufacturer. The Kompressor was powered by the Model 255 engine with overhead camshafts (2 per cylinder) both driven by a single timing shaft. The engine was mounted in an R5 frame outfitted with telescopic forks and a Zoller supercharger, which was built into the front crankcase assembly. The machine could clock in at 142mph, its 500cc motor cranking out 80BHP at 8000rpm. Among the numerous races the Kompressor would win, Georg Meier rode it to victory at the Isle of Man Senior TT in 1939.



Telescoping Front Forks

The introduction of telescoping front forks was a major leap forward in motorcycle engineering. Using hydraulic shock absorbers and helical springs, telescopic forks signaled the end of the rigid girder fork of the past and ushered in improved motorcycle designs that made for easier handling machines. Telescoping front forks also allowed for the added benefit of reducing wheel size making for more efficient use of engine power. It was the Second World War that opened this technology to the world, side-stepping the many patents that were issued in an attempt to protect the innovation. In fact, telescoping fork technology is still used in all modern motorcycle designs.



Motorcycles

design/technology

1936-38

Plunging Telescopic Rear Suspension

Shortly after telescoping front forks were incorporated into motorcycle design the same principle was applied to the back wheel. Incorporating straight guide sleeves on vertical tubes rear suspension was included on racing models in 1936. This innovation would find its way to production machines two years later. In combination with the telescoping front forks, rear plunging suspension put the motorcycle under greater hydraulic control, offering better damping and improved comfort. BMW trials rider and engineer Alex Von Falkenhausen is credited with the innovation.

Motorcycles

design/technology

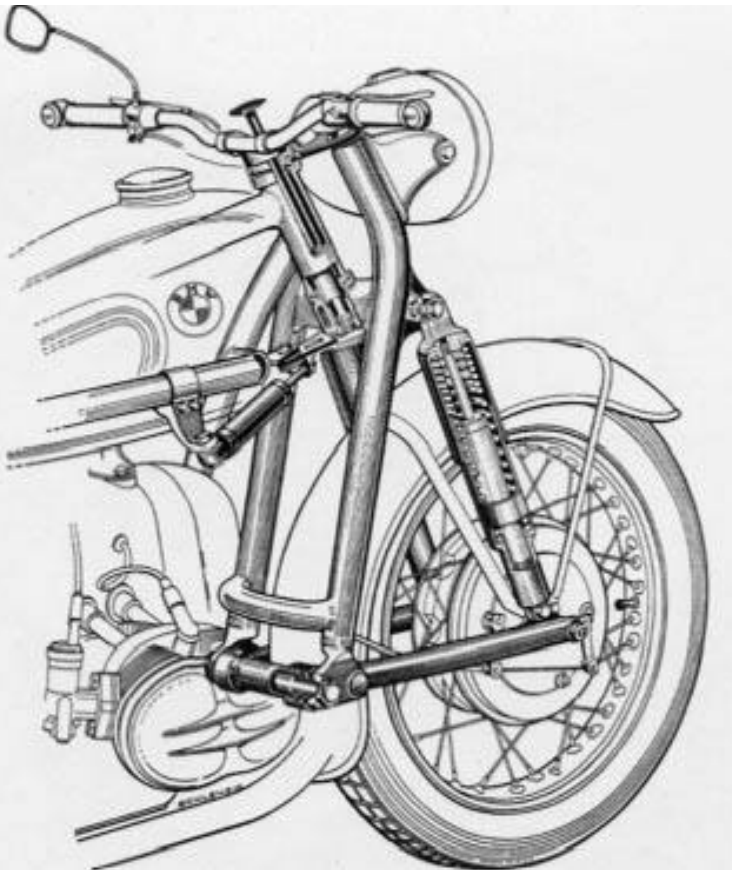
1955

Full Swinging Arm Rear Suspension

The next step in the evolution of BMW suspension engineering, full swinging arm rear suspension allowed for longer spring travel and offered less friction by moving away from the wear-prone straight-travel suspension. This innovation gave BMW motorcycles a smoother ride in comparison to older models. However, the technology worked better on chain drive machines. Drive-shaft motorcycles, like BMW twins, had a lifting action when starting off and accelerating. So while full swinging arm suspension was a step in the right direction, as the company developed more powerful engines it would require enhancements to the suspension system as well.

Earles Type Forks

Invented by English engineer Ernie Earles of Birmingham, this technology was virtually ignored at home yet widely adopted abroad, especially by German motorcycle manufacturers. The spring damper units worked on two leading links and pivoted on a mounting behind the mudguard. As such, Earles Type Forks were very suitable for sidecar work. It's limitations came with solo riding where it didn't perform well on fast rippled curves. They also had a habit of making the front end light when a passenger and laden panniers were carried. The Earles Type Fork first appeared on the BMW R26 but would go on to figure into many future models.



Motorcycles

design/technology

1976

Full Fairing

First appearing on a BMW motorcycle in 1976, full fairing made its debut on the R100RS. The precise contours and engineering of the fairing were designed in the Pininfarina wind tunnel in Italy. Aside from establishing a more contemporary aesthetic, the R100RS's fairing created a still pocket of air around the rider while applying a downward thrust on the front wheel adding to overall stability and speed. So successful was this design that it wasn't substantially modified until 1993.

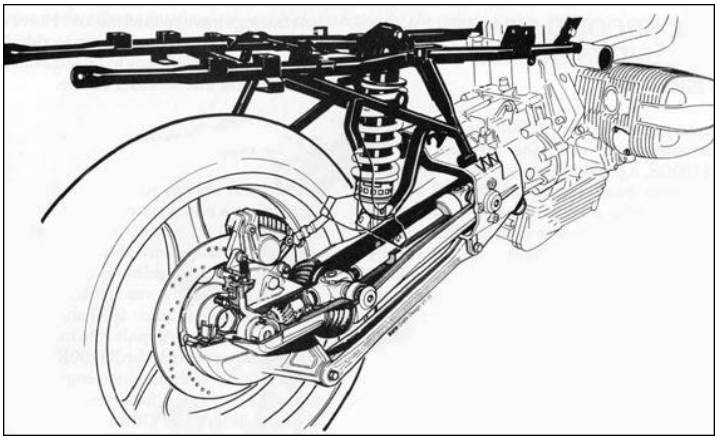
Motorcycles

design/technology

1980

Monolever Rear Suspension ('Paralever')

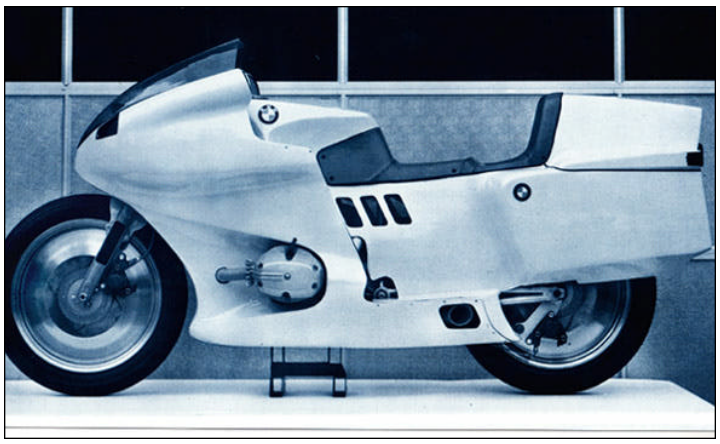
Enhancements to suspension technology took another giant step forward with the invention of monolever rear suspension (which BMW would call 'Paralever'). It was designed with the imminent water-cooled K-Series in mind but found its way onto the twins first. In essence, the standard two arms carrying the rear wheel were replaced by a single-sided rear wheel mounting which allowed for greater suspension travel. The dampening effect minimized rear suspension rise and fall during acceleration and deceleration giving the rider more predictable control of the motorcycle. Paralever technology first appeared on the cross country R80G/S but would be adopted for all future boxer models.



1980

The Futuro Concept Bike

It was designed as BMW's glimpse into the future of motorcycle engineering. The futuristic 800cc flat twin Futuro was first presented at the engineers' show in Cologne. The Futuro was built with digital instrumentation including a microprocessor which monitored the machines running temperature and kept account of engine revolutions. The engine generated 75BHP of power and could reach a top speed of 125mph.



Motorcycles

design/technology

1983

The K-Series

Knick-named the "Flying Bricks" the water-cooled, four cylinder K-series engines were BMW's response to its Japanese competitors. It cost BMW nearly 300 million Deutschmarks, largely borrowed from the automobile division, to design the first K-series motorcycle, the K100. Joseph Frizenwenger's engine, with its all-light-alloy wall and dual overhead camshaft (DOHC) was mounted on its side, giving the bike a low center of gravity. The motorcycle was equipped with a compact five-speed gearbox, digital ignition system (a first on a production motorcycle), 3 perforated disc breaks (two in front, one in back) and the Paralever suspension system. Topping out at 132mph, the 1000cc fuel injected engine generated a whopping 90BHP of power. The launch of the K-Series was a superbly orchestrated effort generating appropriate hype and anticipation - not to mention a little concern from flat twin traditionalists regarding the future of the boxer.

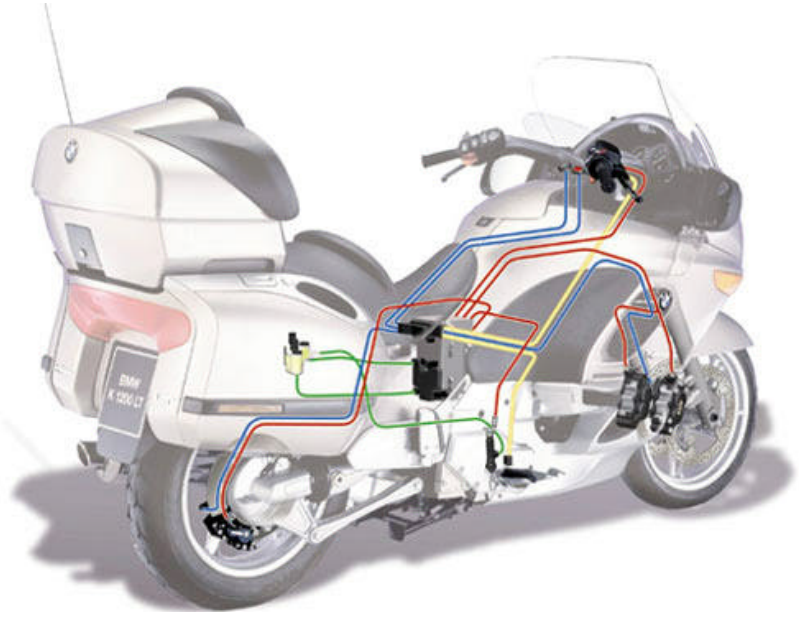
Motorcycles

design/technology

1988

Anti-lock Braking System

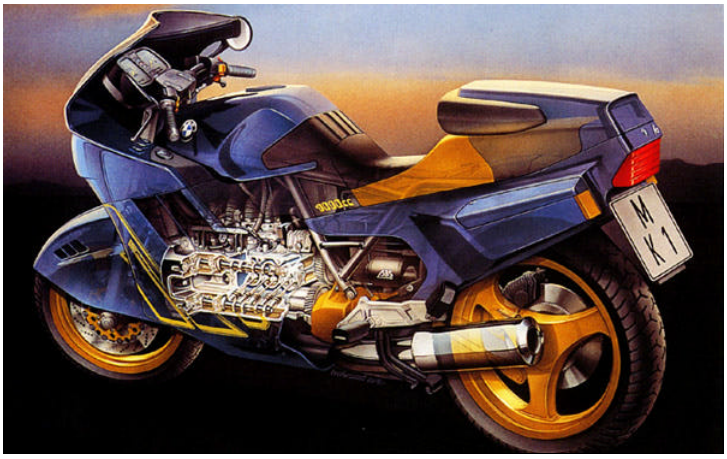
Considered the motorcycling safety aid of the decade, ABS was first introduced to BMW motorcycles in 1988. When the brakes are applied, an electronic sensor reacts nearly instantaneously to reduce brake pressure if lock-up looks imminent. That pressure is restored as soon as possible causing the trademark 'pulsing' of the brakes. By 1990 BMW would make ABS standard on all K-series motorcycles. Their competitors would reserve this important safety feature for only their high-end models. A second generation ABS II was introduced in 1993 on the R1100RS and current K-series models.



1988-89

The K-1

The first production motorcycle with digital engine electronics, the futuristic K-1 was released to the public one year after it's design in 1988. It's sixteen valve, four-cylinder engine generated 100BHP at 8000rpm propelling the motorcycle from zero to sixty in four seconds and reaching a top speed of 143mph. It was everything BMW was supposed to NOT be: flashy, unconventional, stylish and over the top. Finished in bright red with yellow graphics it left many traditionalists dumbfounded. But with its 0.4 coefficient drag (which compared well with Formula 1 racing cars, and is the best ever for a motorcycle) it was a model that grabbed headlines. With wind cheating body panels and wheel covers, modified suspension, ABS and a reinforced frame holding that monster engine, the K-1 became BMWs fastest-ever production machine.



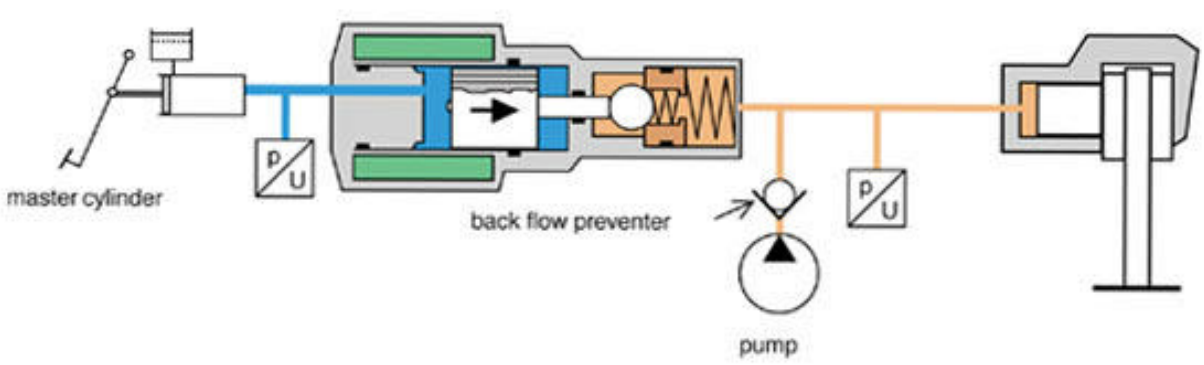
Motorcycles

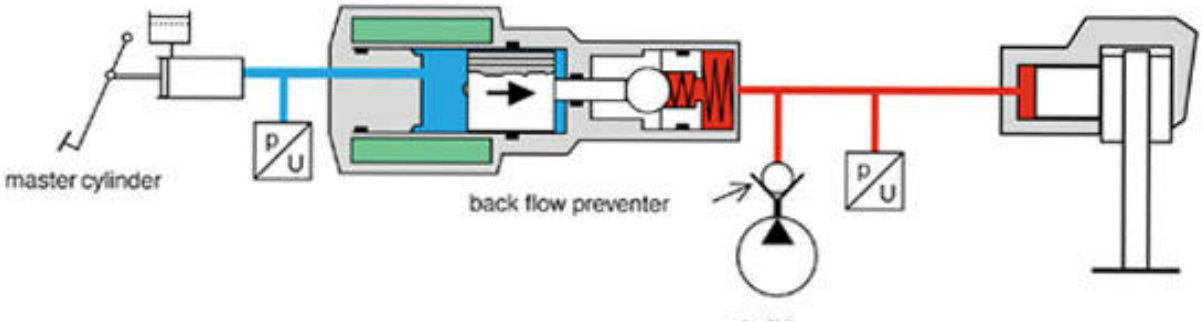
design/technology

1991

Three Way Catalytic Converter

Working with the motorcycles Motronic engine management system, the three-way catalytic converter adjusts the fuel-air mixture to optimum levels for power and efficiency substantially cutting exhaust emissions. Hydrocarbon emissions dropped as much as 86% with carbon monoxide following at the same rate. Nitrous oxide rates dropped substantially too, down 80%.





Motorcycles

design/technology

1993

Telelever Front Suspension

Offering new levels of road compliance, Telelever Front Suspension uses a ball joint and coil swinging arm combination to brace the font fork and enhance stability against potential front wheel movement. The arm, which runs along the crankcase above the cylinders, connects to a cross brace on the fork sliders above the front wheel. Telelever suspension gets its stabilizing power by channeling the force applied against it to the strongest part of the chasis. It also effectively separates steering from suspension allowing more precise handling.