



Honda RCV1000RR

A rare cross-section of a modern high-power racing engine is available at:-

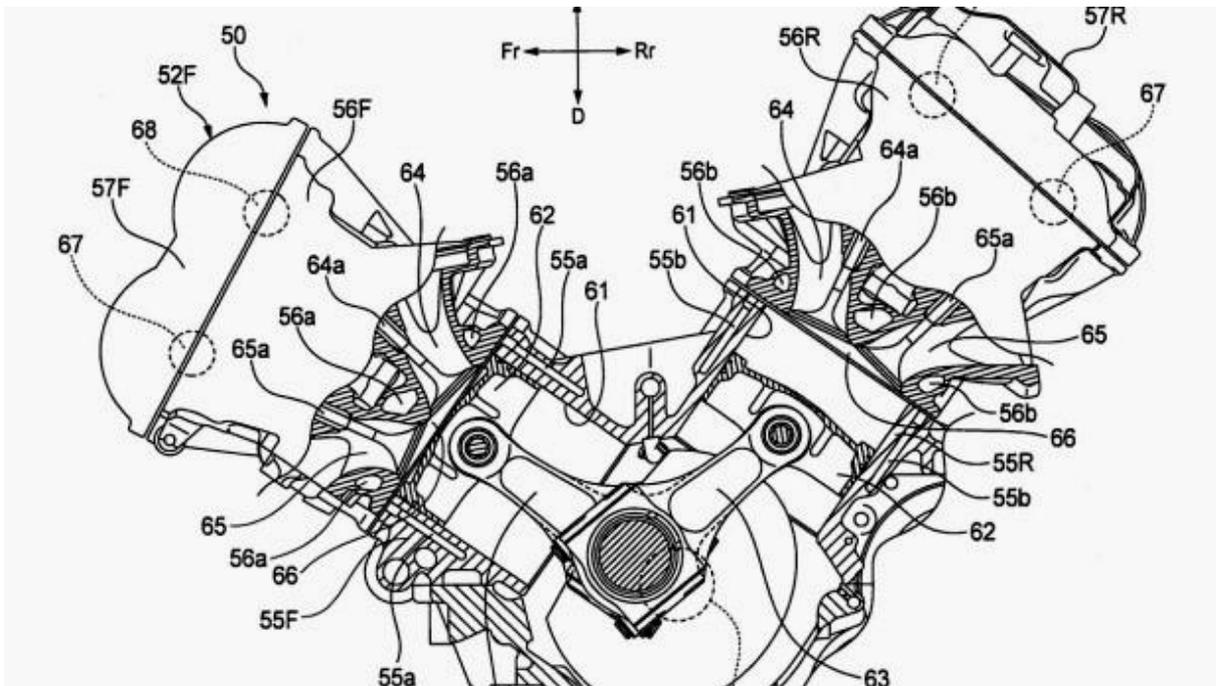
<http://gas2.org/2014/04/05/honda-rcv-1000-street-engine-revealed/>

This is a Honda patent drawing for a motorcycle engine from March 2012. It has been suggested that it represents the 2015 Honda RCV1000RR, intended to be street-legal but also eligible to compete in the “Open” class of MotoGP (i.e. with independent teams, alongside the “Factory” class machines).

It seems likely from the date that the design shown is based on the 2012 Honda RCV213V factory engine and therefore it gives the latest known internal details of a front-rank racing engine (Honda powered the riders who were 2nd and 3rd in the 2012 Championship, which was the 1st year when MotoGP went to 1,000cc/4 cylinders).

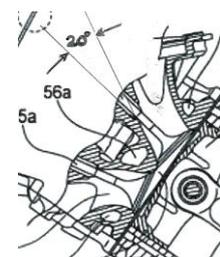
90°V4; Bore (B) = 81mm (rule maximum allowed);
 Stroke (S) = 48.5mm;
 Swept Volume (V) = 999.7cc.;
 Watercooled; DOHC; 4 v/c.
 Forward pair of cylinders at 55° to vertical; rear pair at 35°

} B/S = 1.67.



Various interesting details can be obtained from the drawing, some by scaling (which has a possible accuracy of ± ½% from an enlarged print).

- Angle between valves (VIA) = 20°;
 - Inlet ports are shaped to provide “Barrel Turbulence” (aka “Tumble Swirl”; see [The Unique Cosworth Story](#) and [Note26](#)) with the outer wall 20° non-orthogonal to the valve head. This is shown in the scrap section at RHS;
 - Inlet valve head diameter (IVD) = 31.5 mm;
 so Inlet Valve Area/Piston Area (IVA/PA) = 0.30.
 - Inlet port downdraught at head entry = 40°;
 exhaust port updraught at head exit = 40°.
- } Relative to plane of cylinder bore.



Mechanical details

- Cylinder barrels are un-lined, i.e. presumably Al-alloy with surface coating;
- 2-ring pistons; Piston Height (PH) = 24 mm. PH/B = 03; PH/S = 0.5.
- Pistons are oil-cooled by spray jets;
- Con-rod Length between centres (CRL) = 89 mm; CRL/S = 1.84. I-section.
- Plain bearings;
- Crank-pin diameter (CP) = 33 mm; CP/S = 0.68.
- Gudgeon pin diameter (GP) = 15 mm; GP/CP = 0.45.
- The valve operating gear is not sectioned, but it was originally fitted with steel coil springs (Coil Valve Return System (CVRS)).

It is reported that for Open class MotoGP racing in 2015 a Pneumatic Valve Return System (PVRS) will be fitted, as used on the Factory Hondas. This would be unsuitable for a street engine, since the system has to be pressurised before starting-up.

More discussion of valve return systems can be found at [Grand Prix Motorcycle Engine Development, 1949 – 2008](#) at pp 19 and 20.

Performance

For the 2014 version Honda claimed:-

175 kW (234.5 BHP) @ 16,000 RPM;

therefore:-

BMPP = 13.1 Bar @ MPSP = 25.9 m/s.

MGVP = 86.3 m/s.

BNP = 21.6 m/s.

The RPM for this CVRS engine looks too high. The Factory Honda RC213V in 2012, which had PVRS, was shown by TV at Indianapolis to be reaching a maximum of 15,000. Perhaps the figure claimed for the RCV1000RR was a pre-test estimate. The performance of the machine in 2014 was reported to be below expectations.

If the power-peak RPM was really ,say, 14,000 then the analysed parameters would be:-

MPSP = 22.6 m/s;

MGVP = 75.4 m/s;

BNP = 18.9 m/s.

Without more details it cannot be determined whether the power of the RCV1000RR is limited by the Open class rule fuel ration of 24 litres (100 Octane No. un-leaded) for the usual race distance of around 120 km.

Price of complete Motorcycle.

It is reported that the complete motorcycle price is \$100,000. This is with a normal gearbox (6 speeds, limited by rule). The “seamless-shift” gearbox of the Factory Hondas would greatly increase the price of the machine.
