Acknowledgement - This is a reformatted version of an article appearing originally in "Motorcycling Monthly" in October 1977 in the UK.

Whilst this example uses the 350 motor, the principles apply to any of the V twin Morini engines or singles based on the V twin.

The Italian motorcycle industry has always been renowned for its imaginative engine designs and the Morini motorcycle company are no exception to the rule. Their 350cc, pushrod, overhead valve V-twin is unique with its nylon-toothed belt drive to the camshaft and Heron-type combustion chambers set in the piston crowns.

The unit construction engine/transmission is extremely robust as we learned from our arduous 10,000 kilometre test of the Strada published last month and although we suffered a number of ancillary equipment failures, the motor and gearbox proved faultless.

To complete our analysis of the Morini 350 we stripped the engine/transmission in our workshop to discover what the task entailed and to find out how much wear, if any, had taken place.

With a reasonably comprehensive metric toolkit, a set of Allen keys and a flywheel extractor, you should find no great difficulty in dismantling or assembling this easy-to-work-on power unit. Only the fact that the crankcases split vertically instead of horizontally make for a few problems on reassembly. End float spacer shims on the transmission must *all* be relocated properly before clamping the cases together and all mating surfaces must be thoroughly cleaned and the correct gaskets used or oil leaks will result.

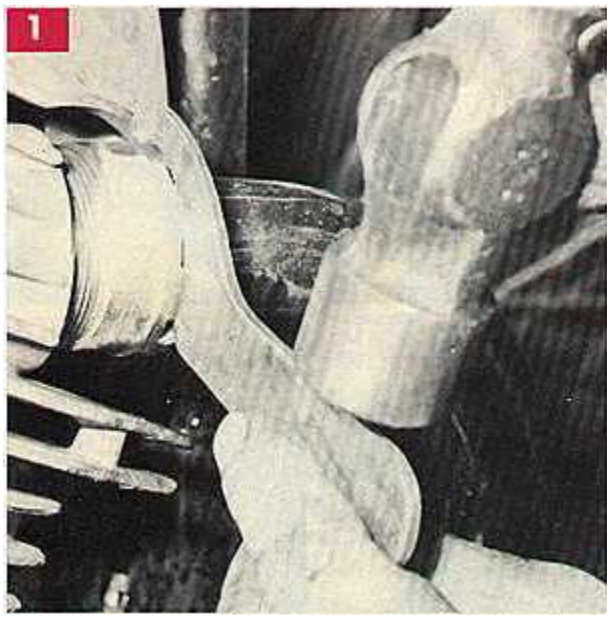
Most of the engine dismantling work can be carried out with the motor in the frame — in fact, it is far easier that way.

Dismantle in frame

First and foremost, drain the engine/transmission oil by removing the 18mm sump plug on the base of the motor.

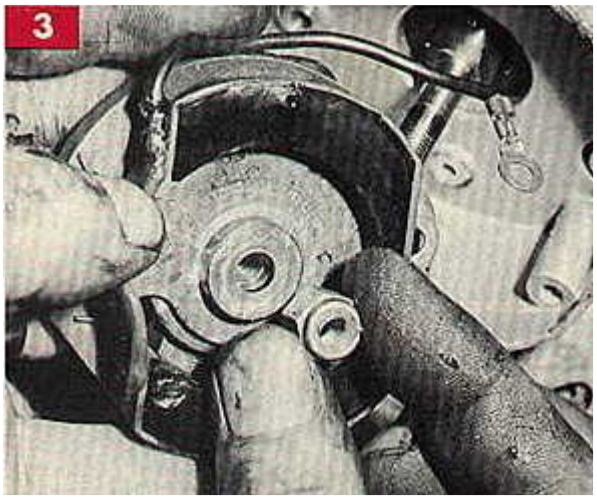
While the oil is draining, you can be removing all the fixtures and fittings such as the footrests (8mm Allen bolt), kickstart (10mm), rear brake pedal and gear lever (10mm).

Remove the seat and fuel tank, not forgetting the fuel pipe connections to the carburettors and electrical connections to the petrol switch under the tank (blue wire to bottom connection, brown at top). Now the exhaust pipes may be unscrewed at the exhaust port **(1)** using a C spanner. After undoing the silencer clamps (10mm) and retaining bolts (17mm), the silencers are pulled off.



Next loosen the clamps on both sides of the exhaust balance pipe (10mm) and pull the rear cylinder exhaust pipe out of its port. Note that as the pipes pull out of their ports, there should be a split collar **(2)** and gasket to seal the joint behind the castellated nut. Renew the gaskets on rebuild.

Before starting work on the electrics, first remove the battery from its housing below the saddle. Now, remove the cover plate on the electronic ignition pick-up, undo the 11mm nut and two 3mm Allen bolts and pull off the complete unit **(3)**. Note black earth wire is mounted on upper Allen bolt; to retime the ignition on reassembly, turn the flywheel so that the 'ANT-1' mark lines up with the timing mark on the crankcase (front cylinder on compression stroke with both valves closed). Refit the pick-up as one unit with the timing marks on the rotor and stator aligned with the cover mark at 8 o clock. This gives accurate static timing but it is wise to check the flywheel mark using a strobe light to ensure that the flywheel 'ANT-1' mark correctly aligns with the corresponding mark on the crankcase with the engine running at 6,000rpm.



Pull off HT leads to the spark plugs and tuck them up onto the frame.

Now fully slacken the clutch cable adjuster at the handlebar and while pressing against the operating arm **(4)** unhook the clutch cable nipple.

Next unscrew the air intake rubber retaining clamps at both carbs and after removing the two 10mm through bolts securing the air filter box to the frame, the complete unit **(5)** may be lifted clear. Note that six 7mm screws hold the two halves of the filter box together and the two elements inside can be cleaned in petrol but should be renewed every 6,000 miles.

To remove both carburettors, first slacken the 8mm clamp screws. The carbs are usually a very tight fit, but by using a twisting action aided by gentle but firm tapping with a wood block on the clamp, they will eventually lift off.

All engine breather pipes may now be pulled off. There is one on each rocker box and a large breather at the rear of

the crank case.

Now remove the final drive side flywheel cover **(6)** by undoing five 5mm Allen bolts. There is no gasket fitted.

Undo the clutch arm adjuster locking nut (11mm) and removing the screw together with operating arm **(7).** Withdraw the short length of clutch pushrod which protrudes behind the operating arm.

A special tool MOR-T2 should be used to hold the fly wheel while the 22mm centre nut is undone **(8)**. Alternatively, locking the motor in gear and applying the rear brake, the special tool can be discarded.

However, a flywheel extractor 'MOR-T3' is essential to pull this unit **(9)** off its taper. The extractor must be screwed fully home before extracting the flywheel. Note that there is a Woodruff key on the tapered flywheel shaft.

Behind the flywheel is the stator plate which is easily removed by undoing three retaining screws **(10)**.

At this stage, the camshaft drive belt guide washer (radius towards belt) and spring can be taken off **(11)** after first removing the circlip. Note the reassembly sequence.

The final drive sprocket may now be removed **(12)** by locking the motor in gear, firmly applying the rear brake or using a sprocket holding tool and undoing the 22mm nut. This saves splitting the rear chain.

There is an electrical earthing connection **(13)** on the upper, rear crankcase bolt adjacent to the oil filler hole. Remove the filler plug and disconnect the earth wire.

Now the oil filter cartridge **(14)** can be removed after undoing two 5mm Allen bolts and lifting off the filter cover. This should be washed clean in petrol before refitting.

To remove the camshaft drive belt, rotate the motor while gently easing the belt outwards with a pair of flat-faced pliers. This belt should be renewed at least every 12,000 miles.

Next remove the 17mm camshaft sprocket nut. It is not necessary to remove the sprocket itself at this stage. **(15)**

Clutch

On the opposite side of the motor, remove the clutch cover **(16)** and unscrew the five clutch spring retaining screws.

Lift off the clutch pressure plate **(17)** complete with springs and cups.

Behind the clutch pressure plate is the operating 'mushroom'. Pull this out and lightly lubricate with graphite grease on reassembly.

The clutch plates are hooked out, there being five thick lined plates and five plain steel, plus one thin lined plate which is last to be removed and first on reassembly. Renew if plates are oil-soaked or worn on faces or splines.

To remove the clutch centre, first knock down the locking tab washer. Next place a perfect fitting open-ended spanner over the final drive shaft **(18)** with first gear engaged. Now undo the 22mm clutch centre nut which has a seal to stop oil getting into the clutch.

Lift off clutch centre **(19)** and note the spacer shim behind. This brass bearing should be refitted with ears towards clutch housing.

At this point it is possible to remove the inner drive cover by undoing eleven 5mm Allen bolts (two of which are in the ignition pick-up housing). Place an oil tray beneath and tap casing with a hide mallet to part joint **(20)**.

Top end strip

Both cylinders may be treated the same as the procedure for dismantling both is identical. First remove the three 5mm Allen bolts from each rocker cover and lift off covers **(21)** Clean off all gaskets and cement on both mating surfaces for reassembly.

Rotate the crankshaft until both valves are closed on the cylinder on which you are working. Remove the four llmm nuts and the rocker assembly blocks, making careful note from which cylinder they are removed **(22)**. On reassembly, all tappets are set with 0.1mm (.OO4in) clearance when cold.

Now lift out the pushrods noting that the rear rods are 2mm longer than the front.

Mark the cylinder heads (1 front) and (2 rear) and undo the four 13mm nuts and one 5mm Allen bolt to lift off **(23).** Note that on assembly the nuts should be tightened diagonally in phases to a torque setting of l8lbs/ft. Always renew the head gaskets with the wide copper circle uppermost.

With both cylinder heads removed we returned to complete the dismantling of the primary drive side of the motor. When the inner case was removed complete with clutch housing, a centre bearing and spacer were left on the gearbox mainshaft. With these removed **(24)** the oil pump **(25)** is taken off after first undoing the three 5mm Allen bolts.

The green neoprene bush seals the main oil feed to the crankshaft and *must* be in good condition on reassembly. Do

not lose the small o ring behind the pump.

The next item which we simply lifted away from the crankcase was the kickstart mechanism **(26).** Make careful note of how the return spring engages in the casing.

Both cylinder barrels may now be carefully slid from their studs and after prising out their circlips, the gudgeon pins may be pushed through the pistons **(27)**.

NOTE which way the pistons face and mark both barrels and pistons front and rear for matching on reassembly.

With wood bracing across the crankcase mouths, insert a mandrell through the small-end to lock the crankshaft.

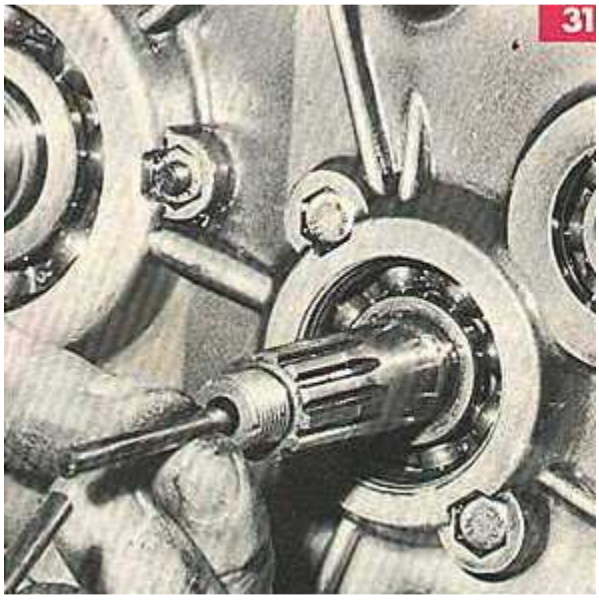
Undo the 27mm nut on the primary drive pinion **(28)** which should be renewed on reassembly. Refit and tighten firmly, locking the crank in the same way.

Mark the outer face of the oil pump worm gear and pull off before removing the primary drive pinion **(29)** with its Woodruff key. Note the spacer behind the pinion.

Engine out

Nothing now remains but to undo the engine mounting bolts, including the two front engine brackets and lift the crankcase assembly out of the frame **(30)**.

As the motor is tilted over, take care not to drop or lose the inner two clutch pushrods **(31)**.



Next, remove *nine* 5mm Allen bolts with 10mm captive nuts which hold the crankcase halves together **(32)**.

There are two dowels, one at the top front and the other at lower rear engine mounts which have to be punched through **(33)**.

NOTE that two of the 5mm Allen bolts in recesses at the rear and centre of the cases have oil sealing copper washers. It is vital that these are renewed to avoid oil leaks after reassembly.

Gently tap one crankcase half to break the gasket joint and with the rear cam followers lifted to their maximum height, turn the crankcases over on to their righthand side and with gentle but firm use of a hide mallet, tap the crankshaft and gearbox mainshaft until the case lifts off. Make especial note of all shims and spacers and their location on shafts as the two halves separate.

With the cases parted, the camshaft may be tapped through from the drive pinion side and the cams and followers inspected for wear.

The complete gear cluster with selector drum **(34)** will lift away from its crankcase half. Take especial note of shim positions for correct reassembly. Check all gear pinions and engagement dogs for any signs of wear.

Next item to lift out is the gear selector mechanism **(35).**

Before attempting to drift the crankshaft from its case bearing with a hide mallet, a special extractor — MOR-T4 — is needed to pull off the camshaft belt drive pinion. This is used in conjunction with the retaining circlip to remove the pinion.

Once the pinion has been taken off the crank, brace the casing and firmly drive the crankshaft out of its bearings.

Finally, to inspect the big-end the bearings undo the special, self-locking big-end bolts. With all components of the motor cleaned, inspect bearings and all bearing surfaces for wear. Renew all gaskets on reassembly and take great care to replace items exactly as they were removed. Irreparable damage can be caused by omitting an oil sealing ring or refitting a piston the wrong way around.

Engine analysed

After dismantling our Morini, we were delighted that in spite of its very tough test life, there was minimal wear on all engine components and apart from renewing all gaskets, tab washers and circlips, no major items needed to be bought.

Slight rusting had taken place inside the alternator housing which is over-ventilated and allows water to penetrate to the lower cam drive pinion, making removal difficult. Both the final drive sprocket nut and the clutch centre nut had been over-tightened on assembly.

However, with the assistance of the Morini service manual, we were able to complete the strip and reassembly with only a minimum of problems.

No measurable wear had taken place inside the motor with the camshaft and cam followers indicating perfect contact areas. The pistons still had original machining marks on their bearing surfaces, while the big-end shells showed no signs of scuffing or scoring.