RAW-J/VBT

5th April, 1961.

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File

Report of Development Work in Progress
March, 1961.

Paragraph Nos. refer to Minutes of the Development Meeting held on March 16th.

1.- Silencing:-

The failure of tab washers to prevent occasional loss of the nut securing the silencer end is probably due to shearing of the small tag, which fits in the groove. Some instances have been seen where, after removal of the nut to change the sealing washer, this tag has been sheared. This could happen either when tightening or removing the nut.

The silicone rubber ring referred to last month was fitted, but after about 300 miles was found to develop cracks across it. The suppliers (Messrs. R.Klinger Ltd.) state that these are due to heat and petrol vapour. They do not consider that this is a suitable application for silicone rubber.

Messrs. Coopers Mechanical Joints have sent some sample copper asbestos washers of suitable dimensions. These have been fitted to three machines and appear to be satisfactory. Quotations have been asked for but not yet received. These will probably be cheaper than any form of rubber "O" ring.

1.- Silencing (Contd.)

An enquiry has been put out to Messrs. Turners Asbestos Cement Co. Ltd. for endless woven asbestos rings. These will quite possibly be dearer than copper asbestos. Meanwhile one machine is being run with a piece of asbestos string wrapped round twice. This seems to be satisfactory, and is probably the cheapest possible arrangement so far as material cost is concerned, but awkward to fit and liable to blow if not correctly fitted.

Some modifications have been made to the experimental silencer fitted to the 350 cc Bullet machine with a view to reducing the cost. The spiral baffle at the entrance to the cylinderical portion of the silencer has been omitted with no noticeable change of note or increase in noise, and with certainly no loss and a possible gain in performance.

The 2½" diameter perforated cylinder has been replaced by one of "nutmeg grater" material, and the glass wool packing omitted. This however, has made the silencer less effective, and it is now nearly if not quite as noisy as a standard silencer. If nutmeg grater material with different size and spacing of the holes can be obtained however, it is possible that better results can be achieved.

It is perhaps of interest that when I visited the Bristol Motor Cycle Club on March 29th, I was asked if we were doing any development work on silencing as one of our sports models "was a bit raucous".

2.- Springs for Undamped Heavy Gauge Front Forks:-

The springs intended for sidecar work with this type of fork have not in fact been fitted as was stated in my Report for February. These will be run on the Pave when opportunity permits, but are not considered urgent since none of the machines listed with undamped forks are intended for sidecar use.

3.- New Fork Head Clip:-

The pattern for the new Head Clip has been modified to improve the appearance. The proposed fabricated fork Head Clip for use with the leading link fork presents difficulties, and Mr. Thomas is now thinking in terms of a casting for this.

4.- Lubrication on 700 cc Engines:-

(a) The engine incorporating plates running from the oil well to the cylinder base has, as mentioned in the report for February, been rebuilt following the shearing of a timing sprocket locating peg, and has again been tested at M.I.R.A.

4.- Lubrication on 700 cc Engines (Contd.)

Trouble was again experienced, this time in the shape of a broken eccentric pin at the forward end of the pump driving spindle. This trouble was recently reported by Westwood, and in this instance was clearly due to the pump spindle having been forced forward, probably by oil pressure in the secondary side of the feed pump. This forward movement is resisted by the end of the eccentric pin coming into contact with the inside face of the return pump cover plate. With this particular type of pump, having a ½ in. diameter plunger and a four-pin cover plate, the inside of the cover plate is recessed to permit the fitting of a pump "disc" deep enough to accommodate a ½ in. dia. plunger. This recess cuts into the track of the end of the eccentric pin against the inside of the cover plate, reducing the track width at one point by 50%. The pin had dug in at this point and jammed, causing it to break off. Later type ½ in. dia. pumps with 6 pin covers and earlier twin, and all Bullet pumps with ⅝" dia. pumps have a smaller recess in the pump cover plate, which does not interfere with the track of the eccentric pin. Engines with these types of pump are therefore less likely to suffer from this trouble.

(b) This particular scheme of extended sump cover plates has now been shelved in favour of the more promising modification to the sump consisting of making the walls deeper as recorded in the February report. The engine with this modification has been built into a frame, and is ready for a high speed test at M.I.R.A.

(c) Some tests were run on the bench on March 2nd using a single start pump worm driving the pumps at 1/12 instead of 1/6 engine speed. This was a repeat of similar tests run on 5th October last (reported on 13th October) but this time the deep sump crankcase was used and the tests were taken up to 6,500 r.p.m.

Table I gives a summary of both sets of tests so far as sump content at the end of a run is concerned. A ½ in. diameter scavenge pump was used for all these tests. From this it will be seen that, whereas the earlier series of tests showed no significant difference in sump contents between a single start worm with a 5/16 in. diameter feed pump and the standard two start worm with a ¼ in. pump, the more recent tests show appreciably more oil in the sumps with the standard arrangement , though this is nothing like as great as was obtained in an earlier test (not recorded in Table I) when 350 cc sump contents were measured after 7½ mins. running at 6,000 r.p.m. with a ¼ in. feed and ⅜ in. return pump using a two start worm.

It will be noted that with the standard pump arrangement the sump content with the deep sump case is some 50% greater than with the standard case, and that all that the single start arrangement

TABLE 1

Date	C/Case	B.H.P.	Feed Pump Dia.in.	Starts on Vorm	Soap Contents %	Time mins	R.P.S. (Corrected)
7/10/60	Stamford	3,000	5	1	100	15	-
"	"	4,000	16	1	150	12½	-
"	"	4,500	"	1	130	12½	-
"	"	5,000	"	1	125	10	-
"	"	6,000	"	1	100	7½	-
11/10/60	Stamford	3,000	5	2	70	15	-
"	"	4,000	"	2	120	12½	-
"	"	5,000	"	2	100	10	-
"	"	6,000	"	2	100	7½	-
28/2/61	Deep Sump	3,000	5	2	190	20	Inf.
"	"	5,000	"	1	180	10	Inf.
"	"	6,000	"	2	175	7½	Inf.
"	"	6,500	"	2	180	5	Inf.
"	"	6,500	"	2	200	5	495
2/3/61	Deep Sump	3,000	5	1	90	15	Inf.
"	"	4,000	16	1	130	12½	Inf.
"	"	5,000	"	1	120	10	883
"	"	6,000	"	1	130	7½	990
"	"	6,500	"	1	135	5	1275
2/3/61	Deep Sump	4,000	5	1	150	12½	Inf.
"	"	5,000	"	1	160	10	4420
"	"	6,000	"	1	160	7½	Inf.
"	"	6,500	"	1	180	5	2880

4.- Lubrication on 700 cc Engines (Contd.)

appears to do is to remove this extra 50%, thus of course keeping the level further from the crank webs.

It is difficult to see why, given equally efficient scavenge pumps, any more oil should be left in the deep sump case than in the standard one. The tests quoted in Table I for February 28th were however, run three times with almost identical results while the tests with the single start worm and 5/16 in. feed pump were re-run with similar results after running the tests with ¼ in. feed pump and single start worm.

At first sight it appears that the improved results with the 5/16 in. feed and single start worm might be due to the fact that there is in theory 22% less oil in circulation, even though the capacity of the scavenge pump has, in theory, been reduced by 50% thus reducing the differential. Curiously however, when the amount of oil circulating is further reduced by fitting a ¼ in. feed pump the sump contents figures are greater at all speeds.

While sump content is reasonably easy to measure and a better guide to the efficiency of the scavenge system than oil consumption, which is unreliable on such short runs and depends on the condition of the cylinder bore, piston and rings, oil consumption is really what matters. For what they are worth the oil consumption figures recorded for the engine with the deep sump (corrected for change in sump contents) show no advantage for the single start worm at any speed up to 6,000 rp.m. (105 m.p.h.) In fact the standard two start arrangement gave zero consumption at these speeds. At 6,500 r.p.m. (114 m.p.h.) the standard pumps gave consumption figures ranging from zero to 455 m.p.g. (the average over four runs being 1330 m.p.g.) and the single start with 5/16 in. feed pump a figure of 1235 m.p.g. With a ¼ in. feed pump the single start arrangement gave 2880 m.p.g. These figures however, do not really mean much in practice, because this speed cannot be held for more than a minute or so at a time.

There is no convincing evidence in favour of the single start worm with a 5/16 in. feed pump, and no fault to find with the standard pump arrangement on the deep sump case up to any speed which can be held for long enough to affect oil consumption. The single start worm with a ¼ in. feed pump feeds only half the normal amount of oil to the big ends and is therefore too risky to be adopted.

(d) In view of Mr. Booker's report that only 10% of the oil fed to the rockers is returned by the secondary side of the scavenge pump, a crankcase has been modified to prevent, as far as possible, oil from the rockers finding its way into the sumps. Another one is being modified to cause the secondary side of the scavenge pump to draw oil from the sumps instead of from the timing case.

5.- Cross Cylinders and Pistons:-

The replacement Cross pistons Ref. Nos. 26 and 27 were found to weigh 12 oz. 8 drms. and 12 oz. 6 drms. respectively. This was considered excessive so these were not fitted. Instead the Constellation with the lighter Cross pistons (Ref. Nos. 13 and 14 - 10 oz. 14 drms. and 10 oz. 13 drms.) was taken to the M.I.R.A. proving ground, and driven hard round No. 2 Circuit. After 20 laps one of the pistons broke up. I have been in touch with Mr. Cross regarding the design of his piston rings, which seem to control the strength and weight of the piston.

6.- Chrome Plated Cylinder Bores:-

Messrs. Monochrome seem to be "hedging" with regard to the price for chrome plating cylinder bores. They now ask for .0015 m. tolerance on the finished bore size. Working to a closer tolerance than this will cost more unless the tickness of plate is reduced.

Messrs. Hepworth and Grandage have suggested spraying the bores of the aluminium cylinders with metallic molybdenum, and have given the name of a firm in London who can do this. These have been written to. This process is apparently the latest American practice.

7.- Slotted Clutch Plates:-

These have been fitted to a Constellation model with J.17 clutch linings. This has covered 500 miles including 20 laps of the No. 2 Circuit at M.I.R.A., and two runs down the timing straight. No trouble has been experienced, and the clutch frees and drives satisfactorily.

8.- Oil Filter on 250 cc Machines:-

Mr. Thomas is still having correspondence with Messrs. Intermit regarding details of the nylon filter.

9.- Batch Tests:-

A 350 cc Bullet and a 500 cc Bullet have been run in and are ready for test.

10.- 250 cc Frame:-

The modified frame from Reynolds has still not been received.

11.- Nylon Roller Cage:-

Final and correct samples were promised before the Easter holiday, but have not yet arrived. As Nylonic Engineering Co. want

11.- Nylon Roller Cage (Contd.)

6 - 8 weeks from receipt of order before commencing delivery of production cages - and have not proved good at keeping their promises - an initial order for 1,600 cages has been placed subject to approval of the final samples.

12.- Five Speed Gear Box:-

I have ridden the Crusader 5 speed myself and agree that, while it is still possible to miss a gear if one is clumsy or careless enough, the gear change is now quite satisfactory. The 5 speed box on the Constellation has started to leak oil and is being returned to Albions for modification.

13.- The Scooter:-

The induction pipe and carburettor are being modified in an endeavour to reduce the amount of blow back. The twist grip gear operation on the complete machine is too stiff and is being freed.

14.- Bottom Link Front Forks:-

The steel links have been heat treated and tempered to a tough condition, and are ready for a test on the Pave when time permits.

15.- Crusader 350 cc Engine:-

This is built and being run in on the test bench.

16.- Under 250 cc Engine:-

Mr. Thomas has started work on the design of a completely new machine with a 175 cc O.H.V. single cylinder engine on a new and smaller crankcase.

Drawings have been received of Zenith carburettors suitable for this machine. Messrs. Amal are developing a new carburettor which will be simpler and cheaper than the Monobloc. Particulars of this have been asked for but drawings are not yet available.

17.- Cross Cylinder Head Joint:-

It is assumed that this will not be fitted to the Crusader engines. It is probably the most satisfactory type so far tried on the Constellation. If an existing cylinder is modified however, the head is lowered by the thickness of the standard copper gasket (.046 in.) thus reducing the combustion chamber volume by approximately 4 cc and raising the compression ratio from the normal 8½ : 1 to 9½ : 1 which is undesirable. There is, of course, also an increased risk of

17.- Cross Cylinder Head Joint:(Contd.)

the valves hitting the piston. The length of the cylinder barrel should therefore be increased by .046 in. to allow for the absence of the copper gasket.

Another point to be remembered with this type of head joint is that when the cylinder is rebored an oversize ring must be used, and the chamfer at the top of the cylinder bore remachined. At .040 in. oversize the outside diameter of the Cross sealing ring overlaps the synthetic rubber push rod tube seals.

18.- New Rear Brake Cover Plates:-

These have now been used on wet roads and have proved satisfactory. The chatter on the brake on the 350 cc Bullet mentioned in the February report has not recurred.

19.- Modification to Oil Pump Spindles:-

As mentioned earlier in this report (Section 4 a) it is apparent that ½ in. diameter pumps with four pin covers are particularly subject to the digging of the eccentric pin into the pump cover. Since this type of pump is not used on single cylinder machines there seems no need to modify the design of these in this respect. This is confirmed by Mr. C.A.E.Booker, who reports that broken eccentric pins are extremely rare, and cases of the pins digging into the pump cover are unknown to him. On the other hand Mr. Lovekin states that he has seen instances of pins digging in on twin cylinder engines with pump covers of the type where the recess does not cut into the back of the pin.

20.- Bottom Link Forks with Bonded Rubber Suspension:-

No work has been done on these.

21.- 750 cc Twin:-

This has been run on the road and timed at the M.I.R.A. Proving Ground. The results so far are extremely disappointing. This machine is the subject of a separate report.

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(R.A.Wilson-Jones.)