7.4 Clutch and Controls

THREE SPEED CLUTCH ADJUSTMENT

by P. G. Taylor.

Like the Scott engine the 3 speed clutch is very smooth in operation and will take a lot of abuse, but if allowed to become out of adjustment and the clutch will become anything but smooth. The clutch is easily adjusted, and I offer the following as a guide.

There are two methods of adjusting the clutch, (a) For a new, or relined clutch, (b) One that has become unevenly worn in use.

Starting with (a);

Remove the speedo drive, alloy shield and rear chain. Release the two $\frac{3}{8}$" bolts and slide the driving sprocket together with its bracket off the splined shaft. Next release the clutch springs and slide the end plate with its three adjusting screws, or thrust pins, off the shaft. These three screws should now be adjusted until they are all projecting the same length from the end plate face. This length will vary according to the thickness of the inserts in the clutch plates and should be measured accurately. The smoothness of the clutch depends upon all the pins being moved together equally and not one more than another. The pins should also be positioned so as to allow for further adjustment of the clutch cable. Cable clearance should be $\frac{5}{16}$. A certain amount of trial and error may be needed to get the pins positioned just right. When the position has been found replace the locknuts on the screws and assemble the end plate, with springs to the clutch. When replacing the springs see that they are all the same free length, as differing spring lengths will cause unevenness in the clutch take-up. The spring lengths should not vary by more than 1/64 to ensure smooth clutch operation.

In replacing the driving sprocket and rear chain, it will be found easier to fit the chain before the driving sprocket by looping the chain around the clutch springs. Making sure the end of the chain is out of the channel in the alloy tray by a few inches, slip the driving sprocket into position and lift the chain onto it. Then replace the spring link. This way will be found easier than trying to thread the chain around the sprocket and along the tray channel.

The second method of adjusting the clutch is, perhaps, easier, but calls for a certain amount of 'feel'. The end plates and springs are left in position. Loosen the thrust pin locknuts a few threads. Making sure the thrust screws are loose, and not binding in their threads, withdraw the handlebar clutch lever until the worm lever thrust ring is just in contact with one or more of the thrust pins. The 'feel' is to screw the pins in or out until all pins are pressing on the trust ring with equal pressure. No number of turns can be counted for this—it is the feel of the pins in each applying equal pressure. Rotate the clutch and repeat the foregoing adjustment until uniformity is obtained. Futher indication of the smoothness of the clutch may be felt by depressing the kickstarter and slipping the clutch against compression; this may done while adjusting the thrust pins. When adjusted to satisfaction, retighten the locknuts and replace chain, driving sprocket, shield, etc.

To those readers who are worried about clutch rattle, or sounds of 'ball bearings in a jam-jar' as one reader put it, they may be reassured that practically all racing machines, Scott or otherwise, with a dry clutch, have these musical(?) noises and, it, is typically Scott. A certain amount of cure may be effected by keeping the primary chain at the right tension. Relining did cure my clutch, but it returned like a long lost friend after 100 miles, or so.

ADJUSTMENT OF THE SCOTT THREE-SPEED CLUTCH

Brian Lilley

Judging from the letters and enquiries that I receive in connection with the Spares Scheme, some of our members are finding clutch adjustment a problem. In order to assist these members and at the risk of boring our more experienced pundits, I detail the procedure I use in adjusting my clutch so that it operates with a minimum of snatching and surging. This method was taught to me by Tommy Allot, who was a pre-war Scott rider and a colleague of mine when I was with the old Balfour Darwin Group in Sheffield.

Proceed as follows:

A) Remove clutch cover, speedo drive, outrigger sprocket assembly, and rear chain.

B) Check that the centre sleeve-nut has a tab washer fitted correctly and is tight.

C) Slacken off the cable adjuster so that the clutch worm lever is leaning about 40° from vertical towards the rear of the machine.

D) Remove alternative clutch springs, to obtain access to the three thrust-pin nuts. Slacken off the nuts.

E) Screw the thrust-pins in until you can just feel them touching the thrust race.

F) Pull in the clutch hand-lever until it brings the worm lever forward, check the position at which the worm lever just starts to move the clutch (this should be before the vertical position). If it is past the vertical position, try a bit more adjustment on the thrust pins. (If this does not bring the lever before the vertical position, then the lever and worm is probably worn, and requires a new one, £55.00 each from the Spares Scheme.)

G) Pull the handlebar lever to the position just past where the clutch starts to operate, and wedge the handlebar lever in this position. (Steering damper hard on.)

H) Leave the sparking plugs in the engine, operate the kick-start lever so that one thrust pin is at 12 o'clock. The plates with inserts should stay still.

I) Slacken off this thrust pin so that it just takes the weight off the thrust plate. Lock this pin in this position lightly by means of the lock nut.

J) Turn the clutch until the next pin comes to 12 o'clock position (whilst keeping the insert plates stationary) and repeat the adjustment, then repeat for the third pin.

K) Repeat the adjustment on all three pins again, as adjustment of one can affect the others. Replace clutch springs and outrigger sprocket assembly.

L) Take out the wedge from the handlebar lever and adjust the cable so that there is $^1/_2$" of play at the tip of the lever before the clutch starts to operate.

M) Try the clutch, which should be free by the time the worm lever is 10 to 15° past vertical. If it is not, try adjusting the thrust pins in or our by half a turn.

Your clutch should now be all sweetness and light. If not, start again!

Best of luck.

Ferodo Clutch Linings for Motor-cycles

Name and Model	H.P.	Year	Make of Clutch	Disc Clutch: Dia.	Bore	Thick	Insert Clutch: Length	Top Width	B'tom Width	Thick	Disc cone lining or insert ref.	No. per set	Type of Ferodo Lining
SCOTT													
All Models		1932/39											
Flying Squirrel & TT	500c.c.	1928/31	Own				9/16	Dia.	×	¼	BA	40	B154/4
Flying Squirrel De-Luxe & TT	600c.c.	1928/31	Own				½	Dia.	×	¼	BA	126	B153/2
Squirrel	300c.c.	1930/31	Sturmey Archer				9/16	Dia.	×	¼	BA	46	B154/2
Standard & Super Squirrel	600c.c.	1928/29	Sturmey Archer				7/16	Dia.	×	¼	BA	46	B152/2
Standard & Super Squirrel	500c.c.	1928/29	Own				4 13/16	3¼	3/32		L	8	3/SO/1
All Models except Flying Squirrel		1927											
All Models		1925/26											

* * * *

Dear George, V15/5 Aug. 1987

Like many other Scott owners, I have found the Flyer clutch uncomfortably heavy to operate and inclined to slip if oil is allowed to get on the plates, even just a little. It is well known that if one palte is fitted with cork inserts greatly reduced spring pressure is all that is required to make it grip and cork can absorb oil with beneficial effect. It seems, unfortunately, that circular cork clutch inserts are no longer available; however, I have successfully solved the problem with a Scott I am re-building, as follows.

At an autojumble I bought a large plastic bag of wedge shaped cork inserts containing hundreds for only $1. With a piece of steel tube ½ inch inside diameter I made a cutter by filing the outside at one end to a cutting edge, not difficult as cork does not require it to be razor sharp. Then using a piece of hardboard as backing I proceeded to press out my round cork inserts one at a time in the vice. Each one was a tight fit in the tube and had to be tapped out with a suitable length of ⅜" or 7/16" rod and needed filing round the edge so as to enable fitting to the holes in the clutch plate without distortion. The final operation was rubbing down in the normal way on a flat surface, and the job was done. The wedge-shaped inserts were not large enough to cut out ⅝" dia. inserts as used in the sprocket plate; this raises the question why did the factory use two different sizes in the first place? The three plates with ½" inserts have 42 in each, the sprocket plate has 40 inserts ⅝" dia. only two fewer but with a total frictional surface area approx. 50 per cent greater. Surely the larger size could have been used in all plates with advantage? Or there is some valid reason perhaps why they did what they did? Does anybody know why?

It might be just as well to point out that cork inserts should never be used with the ultra-close gears, where a certain amount of deliberate clutch-slipping is inevitable.

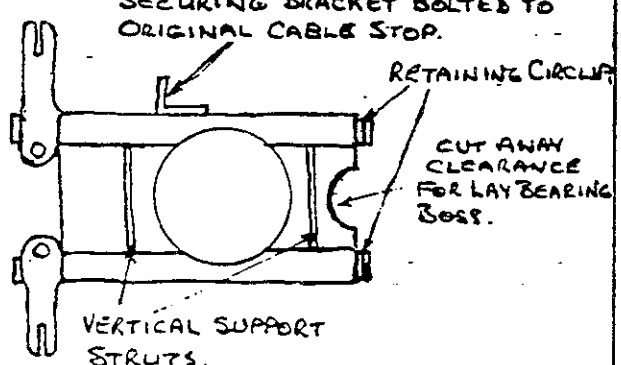
Yours

7.4.03 **Ted Beckham.**

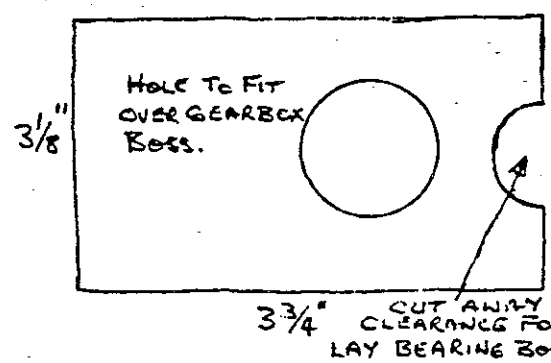
AN ALTERNATIVE CLUTCH WITHDRAWAL SYSTEM FOR SCOTTS

On the two centre pages are drawings and instructions kindly sent in by Derek Whittle which give details of his very original clutch withdrawal mechanism. The underlying principle is that the clutch release bearing is moved by the face-cam effect of the flats on the silver steel shafts when those shafts are turned. The system has proved to be entirely reliable in practice and the clutch frees cleanly and completely. A further advantage is that the components can be made at low cost.

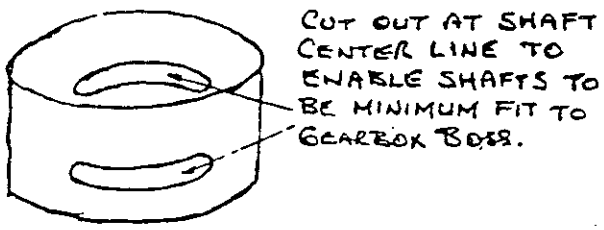
I'VE BEEN ASKED MANY TIMES WHAT IT IS, HOW IT IS, HERE IT IS!



MAKE ONE 14 SWG MILD STEEL PLATE.

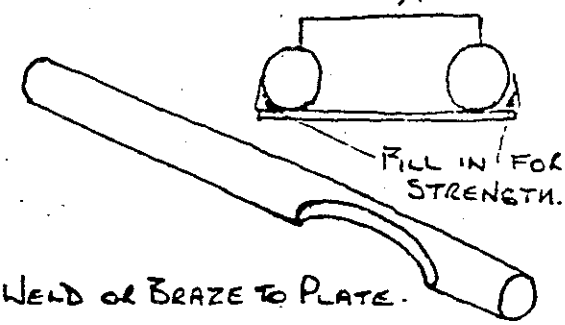


MAKE ONE EXHAUST PIPE TUBE. LENGTH TO SUIT. SEE NOTES.



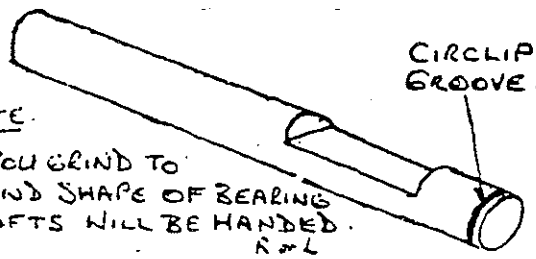
WELD OR BRAZE TO PLATE.

MAKE TWO 5/8" CONDUIT OR MILD STEEL TUBES BORED 1/2". GRIND HALFWAY THROUGH, CLEARANCE FOR RELEASE BEARING O.D. LENGTH 3 3/4"



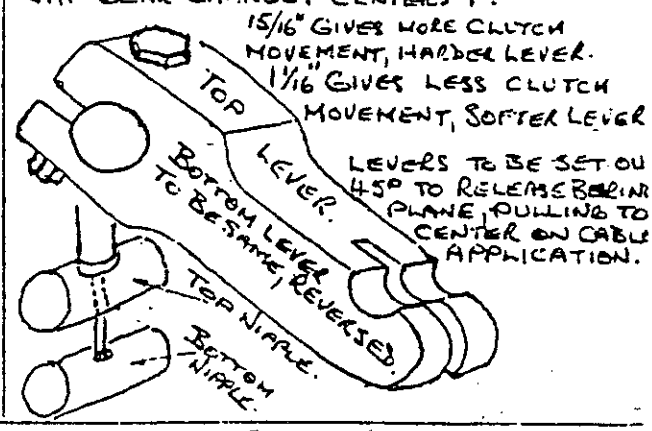
WELD OR BRAZE TO PLATE.

MAKE TWO 1/2" SILVER STEEL SHAFTS. GRIND HALFWAY THROUGH (1/4"), CLEARANCE FOR RELEASE BEARING O.D. LENGTH TO BE 3 3/4" PLUS LEVER WIDTH, PLUS CIRCLIP.



NOTE.
IF YOU GRIND TO ROUND SHAPE OF BEARING SHAFTS WILL BE HANDED. R & L

MAKE TWO CABLE LEVERS, I USED S/H JAP GEAR CHANGE. CENTERS 1".



MAKE TWO VERTICAL SUPPORT STRUTS TO FIT BETWEEN TUBES. WELD OR BRAZE IN. MAKE RIGHT ANGLE SECURING BRACKET. WELD IN, BOLT TO ORIGINAL CABLE HOLE.

YOU WILL FIND ON PUTTING THE PLATE OVER THE BOSS THAT IT SITS AWAY FROM THE GEARBOX SHELL, AND IS ONLY SUPPORTED BY A SMALL AREA. EITHER MACHINE DOWN THE AREA OF BRAZE IN SHAPED SUPPORTS UNDER THE PLATE. MACHINING DOWN GIVES YOU MORE CLEARANCE BETWEEN LEVERS AND CLUTCH UNIT. I MACHINED THE AREA AND FITTED SUPPORTS UNDER THE PLATE, BEAR IN MIND THAT THE TUBES TAKE ALL THE WEIGHT. FINALLY I MACHINED THE BOSS AND TUBE IN POSITION FOR RELEASE BEARING CLEARANCE, BEARING IN MIND LEVERS TO CLUTCH UNIT CLEARANCE.

Derek Whittle's clutch withdrawal mechanism for Scotts.

FROM THE TECHNICAL CORRESPONDENT'S POSTBAG

Dear T.C.,

I'm in trouble with my Scott's transmission. At first I thought the gearbox was at fault but it now appears the clutch is to blame. The take-up is like a midnight wanderer's rattling chains. I have tried every setting of the cable adjuster but there seems to be no point at which I can get a smooth take-up of the drive. I feel there must be other adjustments that should be effected and would be glad if you could give me suitable instructions on the subject.

How much throttle should I use ? She is pulling a sports sidecar and will reach 60 on the level but on hills the power fades right away no matter how much throttle I give her. The pick-up in top is also poor, one must resort to second gear to get any acceleration. The mixture, however, appears O.K.

Dear Mr. M.,

The Scott clutch will always appear noisy to some extent ; remember, it is not enclosed in a sound-proof case. Nevertheless, there are some faults which can make matters worse than they need be. Chipped balls and pitted tracks in the thrust race is one cause, loose inserts and buckled plates are two more. They can only be checked by inspection.

The other two troubles to which the Scott clutch is heir (in common with many other makes) are slip and drag. There is a third that it shares with the Velocette, which it resembles, surging and snatching on take-up. Eliminating this last one is difficult but the best method known is as follows :—

(1) Remove rear chain, speedo drive, drive-sprocket assembly and clutch cover. CHECK THAT THE CENTRE SLEEVE NUT SECURING THE CLUTCH IS TIGHT. There should be a locking tab washer.

(2) Slack off the cable adjuster so that the return spring on the worm lever, behind the clutch, pulls the arm to the rear as far as it will go (leaning toward rear of machine about 40 degrees from vertical).

(3) Slacken off the nuts on the 3 thrust-pins set between the clutch springs. (Removing alternate springs may help here). Old clutches do not have adjustable pins.

(4) Screw in the thrust pins until you feel resistance as they meet the thrust race.

(5) Operate the handle-bar lever so as to pull the worm lever forward. Observe the position at which the worm lever starts to lift the clutch. This should be before the vertical position. If past the vertical (in spite of taking up a bit more on the thrust pins) it is probable that the worm is worn and it will require replacement.

(6) Pull in the handle-bar lever to just past where the clutch starts to lift. Fix it in this position with a wedge in the lever, or other such device. Screw down the steering damper hard to lock the steering head (movement affects cable adjustment).

(7) Leaving plugs in the engine, rotate the clutch-driven members by means of the kick-start, to bring one thrustpin to the top. (The insert plate assembly should remain stationary).

(8) Slack off this thrust-pin and screw in so as to just take up the weight of the springs and the pressure off the plates. Lock lightly with the nut.

(9) KEEPING INSERT PLATES STATIONARY, further rotate clutch until the next thrust-pin comes to the top position and repeat the adjustment exactly as for the first pin.

(10) Repeat (9) for the third pin.

(11) Do all three again since the settings interact to some extent.

(12) Remove wedge from handlebar and set cable adjuster for $\frac{1}{2}$ in. free play at tip of handlebar lever.

(13) Test clutch for freeing by pulling in lever and operating kick-start. It should be quite free by the time the worm lever is 10 to 15 degrees past vertical. If not, try screwing and relocking thrust-pins in or out by EXACTLY half a turn

at a time. Test for smoothness by holding lever at the position at which drag commences ; when kick-start is operated the clutch should slip evenly and not go tight and loose. If the clutch waggles about the back-plate is probably buckled or the thrust-race in the final stage of decay. Strip and check.

(14) If O.K. so far, release handlebar lever, check free play as before, then check that there is clearance in the clutch. Do this by pulling clutch body toward you then attempt to revolve the bronze ball retaining ring and steel thrust-washer behind the clutch. This should be possible using a screwdriver. If they will only revolve with the clutch, the race is under pressure, clutch slip and a worn out thrust race will result from lack of clearance here. With a worn thrust worm (as indicated in 5) it is possible to have over an inch of play at the handlebar but no effective clearance on the clutch thrust.

(15) Note position of slot and lock each thrust-pin tightly in turn. Check that they have not moved, if so, reset and relock to observed correct position.

(16) Replace springs and adjust evenly with studs protruding from nuts.

Notes. All Ferrodo clutches may benefit from soaking any oil off the plates with carbon tetrochloride or trichlorethylene. When removing plates hold the toothed plate hard against the thrust assembly or it will allow the clutch race rollers to drop behind. This friction plate may be wiped over with a rag soaked in solvent whilst "in situ." Check for bent plates and very loose inserts. If toothed plate has to be removed, stick rollers in cage with grease to aid assembly.

Cork clutches are sometimes used but suffer from severe drag unless the corks are pared down close to the plates and lighter spring pressure is used. (The clutch spring nuts may foul the rear of the drive-sprocket if slackened off too far).

Corks 1/32 in. proud are best but an extra steel plate will have to be put in somewhere or the pressure plate will rest on the centre drum. For a permanent modification it is a good scheme to reduce the height of this drum by 3/32 in. ; this automatically gives less pressure since the pressure plate itself lies further in. An occasional dressing of "3 in 1" oil, run down between the plates, will give a very sweet take-up and will only cause slip immediately after application if pressures are right.

As to your "Amal Antics," you have hit on one of the difficulties with two-strokes, namely the difficulty of maintaining a good torque as the revs. fall. The trouble occurs at both ends of the system, namely intake and exhaust: sometimes also in the middle as well if the compression is poor. Look at the list below and see how you are going "agin" nature :—

(1) Inlet port stays open just as long after B.D.C. as it opens before it. At low revs. and large throttle openings the mixture bounces right out again and starts to digest the wiring !

(2) Poor compression loses mixture all the way up the stroke ; on the power stroke power packed gas is lost to the crankcases where it helps to displace newly induced charge as above in (1).

(3) The exhaust-port is enormous on the "Power Plus" engine to clear gas at high revs. At low revs. the newly transferred charge is partially lost because the exhaust closes so late.

From the above it is not difficult to deduce a suitable driving technique. The critical points to watch are throttle, gearing and engine condition. The first means using only as much throttle as she will usefully take ; the second means changing down early and keeping her in the rev. band where she is working efficiently. The second gear on a Scott is the same at the top on most 500 c.c. four-stroke twins—the revs. are more apparent than real. As to the third, a good motor, when hot, will stand the weight of 12 stone on the kick-start for a couple of seconds or so. (Don't compare directly with four-strokes since they have higher geared kick-starts). Your recent oiling troubles could mean a bad state of affairs in the "squeeze and sneeze" department. A strip down and check-over here is indicated if the compression is not up to standard—it makes a big difference on a "chair." I have often thought that one of the short-stroke blocks, newly bored and fitted to the longstroke crankcase, such as yours, would make a good sidecar engine. The short exhaust period would be an advantage, also the restricted inlet ports. The capacity would work out about 630 c.c. or so, giving the punch lower down (below the "belt" ?) where it is needed. Old Len Pease and I have often chatted this one over.

One point regarding gearing. You should check the drive-sprocket when you do your clutch. Eighteen or nineteen teeth is as big as you want with a chair. 19 t - 4.64 : 1 in top.

REMEMBER, OVERGEARING MEANS EXTRA FUEL CONSUMPTION ON A SCOTT ! !

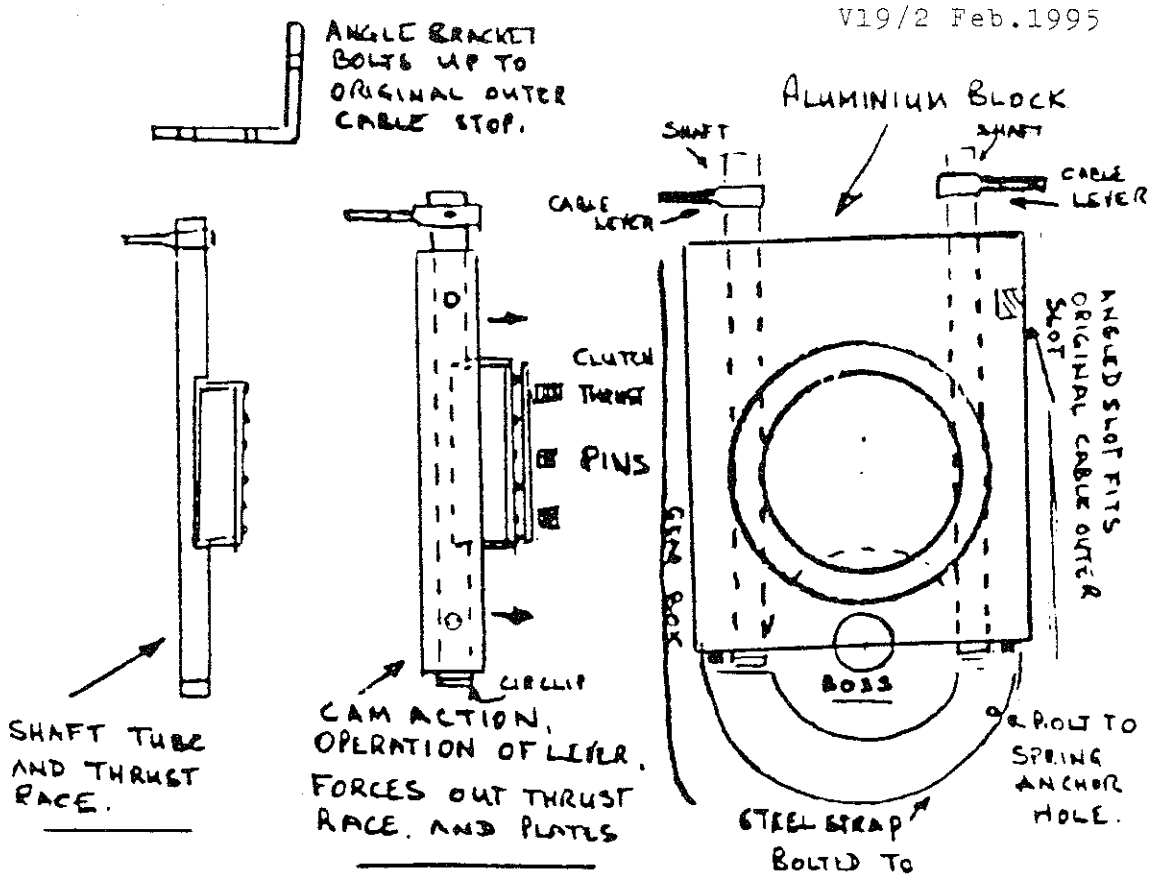


DIAGRAM OF PROPOSED MODIFICATION TO ALTERNATIVE CLUTCH OPERATING MECHANISM

MAIN VARIATIONS ON ORIGINAL IDEA

1. Contained in an aluminium block.
2. Strap secures to boss; reinforced by bolt to spring anchor bolt, and angled slot fitted over original cable outer stop.
3. Block close fits to gearbox,reducing ingress of grit.
4. You do not have to remove boss from gearbox.

NEWS FROM THE SPARES SCHEME

A number of members have expressed interest in the clutch modification that Derick Whittle devised some time ago. As a result of a conversation that I had with Clive Buckett when he was over here from New Zealand for the TT earlier this year, I have recently received from Clive a development to this theme which looks very good. I understand that it works very well. At the moment I am converting the proposal into a working drawing, with a view to getting a quotation for a few kits to be manufactured, as an alternative to the worm and lever original. Of course, I intend to have the modified type tested. If you are interested in the proposed new type, I should be pleased if you could let me know, so that I will have an idea on possible quantity.

Existing supplies of the original type of worm and lever clutch operating mechanism seem to have dried up, but thanks to the help of John Underhill, I now have a drawing, and I am sending out enquiries for the manufacture of a batch, so that hopefully I can once again get them in to stock for the purists. I don't expect them to be cheap, considering the amount of work and relatively small quantity.

Brian Lilley.

CORK UP YOUR CLUTCH, SIR
or
COMING TO GRIPS WITH THE GEARBOX

Dave Acker

Imagine my chagrin when I learned from Brian Lilley that clutch insert supplies were exhausted with little likelihood of relief soon. At that point the gearbox had been surveyed, shimmed, sealed and pronounced as ready as it ever would be, but the clutch was a tangle of bent plates and unanswered questions. The friction plates were a mixed lot consisting mostly of vacancies and a few asbestos/wire inserts having a look of Kibble dog food. One sorry plate had two razor-thin cork discs in it. The drum holes were totally empty. I had assumed that any replacement inserts would be of the more modern asbestos type, but the situation was moot anyway, since none were to be had. I reasoned that older machines probably had cork clutches originally and those stalwarts who drove them anciently did well enough. I could do worse than try it their way. Now what?

'Radco' suggests reducing champagne corks to size with a die turned in a lather. I approved the idea, but had some reservations since, unlike 'Radco', the establishments I frequent could not fill a matchbox with wine corks in the next 100 years. Even if I managed to get any corks to the correct diameter, how thick shall the subsequent discs be made in order to reduce waste of this scarce material? Also, I well remember many years ago the approved method of cork insertion was to drive the discs through a tapered tube which compressed them before they 'easily' entered the plate and expanded to fit tightly. Nay!

I got me to an old hardware store (ironmongers?) and made inquiry. Now this is a place that has not yet gone totally over to plastic blister packaging. Here you can buy cold-rolled steel, wire, bill hooks, twine, stencils, post hole diggers, and corks. I was directed to a low drawer in the north wall — part of the cork selection. They were somewhat organised by size from about 2 1/2 in.to 1/2 in. in the large ends. I had brought my plates and clutch drum and determined that the bin labelled 'size 5' could just be twisted tightly into the plates or pushed firmly for about 2/3 of their length into the larger drum holes. I bought 160 of 'em for 14 dollars and left the clerks to ponder the biggest sale of corks since the onset of Prohibition in 1919.

Stuffing the round corks tightly into round holes did not tax me excessively. Sawing them off 1/8 in. or so from each surface was easier than using a thin-bladed knife or razor blade. I used a backed model-maker's type with very fine pitch. A large piece of medium grit sand-paper contact cemented to a 3/4 in. thick piece of plywood made short work of taking the sawn corks down to about 1/16 in. proud of each surface. My sandpaper came in 9-in. square sheets which made them an ideal size for the 6 in. plates. The board was 15 or 16 ins long for the sake of getting a clamp on it. Any size that would hold the 9 in. paper would be adequate. The cork faces *inside* the clutch drum would require only a bit more.

I had inserted the drum corks from the inside and left the ends about 1/8 in. or a bit more above the surface (as far as I could force them) to avoid the paradox of trying to saw them off at the bottom of a six in. hole. The inside of the drum was done by first laminating two pieces of the earlier mentioned ply and then cutting a rather precise 6 in. disc from it, facing it with the sandpaper and carefully evening out the corks at the bottom to about 1/16 in. again or a little less.

Some observations in passing:

1) Before starting, make the plates, drivers and driven, as flat as you possibly can. Mine were subjected to a four-pound hammer on a hard-wood block. I think a steel block or anvil might stretch or deform the

plates. A lighter hammer would be less risky. Clean release and drag are functions of the flatness of the plates. Perfection is hard to achieve, but some imperfection can be tolerated.

2) The cork dust arising from the work is most offensive and probably fatal in large doses. Work out of doors and up wind with a filtering mask or a wet rag worn *à la* road agent. Fortunately the amount of dust created is not large and perhaps I overstate the case, but it required numerous beverages to make me forget how bad it was.

3) The $1^1/_2$ in. thick disc will be much more effective if a handle of some sort is affixed to the back so that it can be more easily rotated or held in a vice.

4) The clutch pack's thickness can be adjusted by careful abrasion. Mine came out a bit thick, but a few minutes work got everything inside the drum.

In use, the cork inserts have proven effective. The thing has not been really hard-pressed, but in normal use the disengagement is good, gear changing smooth, and departure immediate.