

# SECTION F

## BRAKES, WHEELS AND TYRES

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## BRAKING SYSTEM

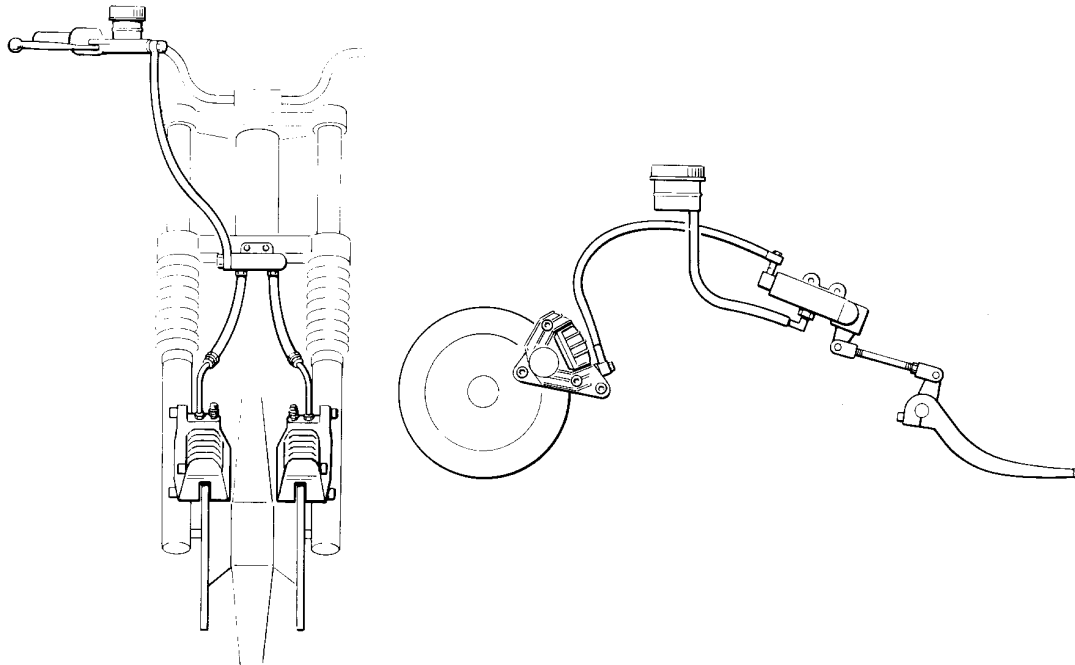


Fig. F1. The Braking System

### DESCRIPTION

All machines are fitted with Brembo disc brakes on the front and rear wheels. The disc brake assembly comprises high quality stainless steel discs attached to both sides of the front wheel hub and to the right hand side of

the rear wheel hub, with cast alloy brake calipers attached at the front to the fork sliders, and at the rear to a fully floating brake mounting plate. The calipers each house a pair of pistons with 'Textar' all weather sintered bronze brake pads fitted for maximum all weather efficiency.

## SECTION F1

### BRAKE FLUID LEVEL

#### BRAKE FLUID LEVEL

A brake fluid reservoir is fitted directly onto the front brake master cylinder whereas on the footbrake operated rear master cylinder the reservoir is remotely located below the seat.

The brake fluid level should be as shown in Figs. F2(a) & 2(b). There is a mark running around the outside of each of the reservoirs approximately 12 mm from the top (upper level) and one approximately 22 mm from the

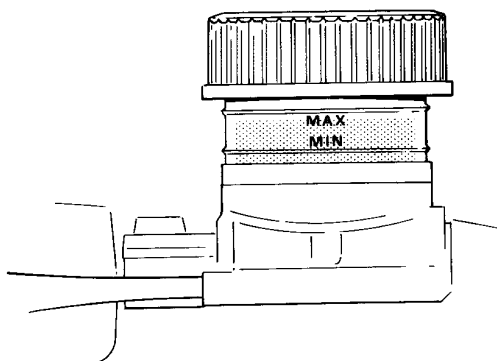


Fig. F2(a). Brake Fluid Level – Front Master Cylinder

top of the reservoir (bottom level). The level will drop slightly as the pads wear and when new pads are fitted the level will return to the original position, providing no leakage has occurred. Provided the fluid level does not drop below the lower mark very little attention will be needed (See lubrication chart Section A1) other than the specified monthly level checks, and the recommended annual fluid change, (See Section F4).

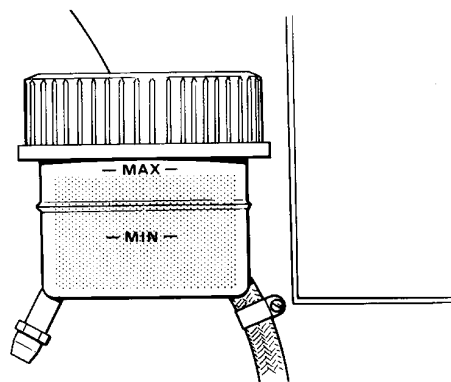


Fig. F2(b). Brake Fluid Level – Rear Master Cylinder

### WARNING

#### FRONT BRAKE LEVER BACKLASH ADJUSTMENT

Under no circumstances should the clearance between the front brake lever and the master cylinder operating piston be altered. The clearance has been set during manufacture and any attempt to adjust the clearance could result in loss of braking operation and possible accident to the rider.

## SECTION F2

### BRAKE PADS

The front and rear brake pads should be examined regularly (monthly – see Section RM Routine Servicing chart) for wear. The pads will require replacement when the lining thickness is 4.5 mm (3/16 in).

New pad thickness 9.0 mm.

Minimum thickness 4.5 mm.

To examine the depth of lining material it is necessary to remove the pads from the brake calipers. To remove the front or rear brake pads, remove the plastic cover over the top of the caliper (Fig. F3) and, pressing down on the hooked end of the spring clip, withdraw the locating pin. Remove the central spring pivot pin and the other locating pin with the spring clip. The pads can now be removed.

When cleaning the brake caliper with the pads removed, be careful to avoid damaging or dislodging any dust seals. Keep a close watch on the brake hydraulic fluid master cylinder level. Do not allow fluid to overflow when depressing the pistons as brake fluid is highly corrosive, can strip paint and will cause permanent damage to tyres.

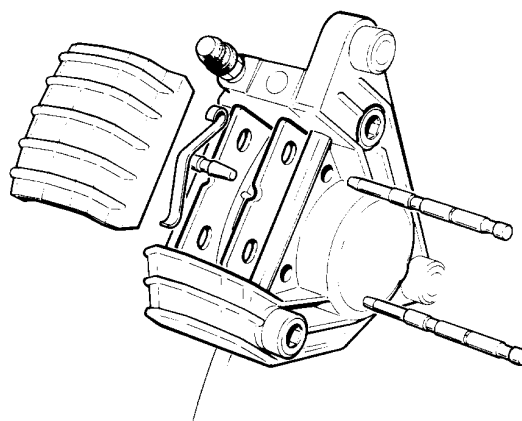


Fig. F3 Brake pad replacement

Replacement of the brake pads is the reverse of removal. When the pads have been changed, apply the brakes five or six times to ensure correct operation.

Care should be taken for the next 50 miles (approx) allowing the friction material to bed in satisfactorily.

## SECTION F3

### BLEEDING THE HYDRAULIC SYSTEM

If at any time it has been found necessary to remove part of the hydraulic system or slacken a pipe junction (for repairs etc), it will be necessary to top-up the hydraulic reservoir and 'bleed' any remaining air from the system. The following procedures apply to both front and rear brakes of the machine.

#### **WARNING**

PARTICULAR ATTENTION MUST BE PAID TO SERVICING PROCEDURES INVOLVING BRAKE SYSTEMS. This section, 'Bleeding the Hydraulic System' is of vital importance and great care must be taken to ensure that correct procedures are followed. Failure to follow the prescribed procedure could lead to an accident.

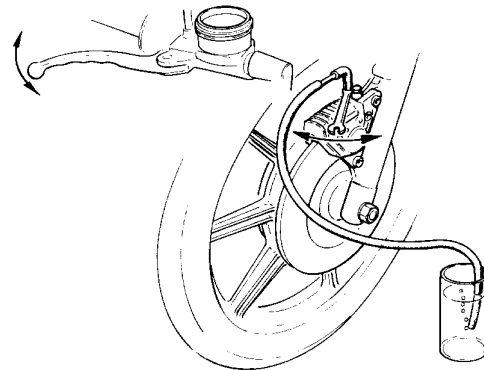
When bleeding the system at all times keep the reservoir well topped-up to ensure no air is allowed into the system from the reservoir.

Fluid drained from the system must not be used again as it may be 'aerated' or contaminated with other chemicals or moisture. Use only the fluid specified in 'General Data' for topping up.

All brake fluid is 'hygroscopic', ie naturally absorbs moisture, and therefore should never be re-used. The caps on both the new fluid container and the master cylinder reservoir must be kept firmly sealed. Open only as the fluid is being used.

Connect a suitable pipe to the caliper bleed nipple and immerse the other end under at least 1" of brake fluid in a clear container (bottle etc). Remove the reservoir filler cap and take out the rubber diaphragm. Now slacken the bleed nipple 1/2 to 3/4 of a turn with bleed pipe attached.

Ensure that the master cylinder reservoir is topped-up to the upper level mark and pull in the front brake lever or push down on the rear brake pedal as far as it will go and hold in that position for a couple of seconds whilst the bleed nipple is released. Any air in the system will have been expelled through the rubber tube and will have been seen to bubble into the container. After closing the nipple, release the brake lever which 're-charges' the system and repeat the operation until no air bubbles



**Fig. F4. Bleeding the Front Brake**

are seen to escape into the container. When the flow of air bubbles cease, hold the brake lever full on and retighten the bleed nipple (with the bleed pipe still connected). After the nipple has been finally tightened, the bleed pipe can be removed. Repeat the procedure for the second caliper (front brake). If 'sponginess' still exists at the brake lever, repeat the procedure until eliminated. When satisfactory operation has been achieved, top up the master cylinder reservoir to the upper level.

## REAR BRAKE ONLY

Disconnect the brake torque arm at the brake caliper mounting plate and rotate the caliper upwards sufficiently to raise the bleed nipple above the level of the pistons before commencing bleeding operations exactly as described above. When operation is complete, refit the brake torque arm, and top up the reservoir to the upper level.

The recommended torque setting for 6 mm caliper bleed nipples is 0.25/0.50 KgM (2.2/3.6 ft lbs) and 0.83/1.24 KgM (6/9 ft lbs) for 10 mm bleed nipples.

Check 'General Data' – Torque Settings for brake torque arm bolt setting.

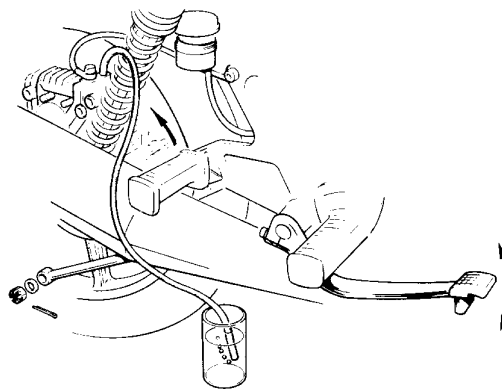


Fig. F5. Bleeding the Rear Brake

## SECTION F4

### FLUSHING THE HYDRAULIC SYSTEM

If the hydraulic system has been contaminated by foreign matter or other fluids it should be flushed out and refilled with new fluid as described below. The system should be flushed out in any case, at the interval stated in 'routine servicing' (Section A1) ie every 12,000 miles or every year, whichever occurs first.

Firstly, pump all the fluid out of the system by opening the bleed nipples connect a pipe to the bleed nipple and safely collect in a container whilst operating the brake lever. Fill the master cylinder reservoir with new hydraulic fluid taken from a new container and

pump out through the bleed nipple in a manner similar to that described in Section F3 Bleeding the Hydraulic System. Having ensured that all the new clean fluid has passed through the bleed nipple, replenish the master cylinder reservoir (see Section F1) with the specified grade of brake fluid (See General Data Section) 'Bleed' the brakes as described in Section F3.

#### IMPORTANT NOTE:

If the system has been contaminated by a mineral oil, all rubber parts including seals and flexible hoses must be replaced.

## SECTION F5

### FLEXIBLE HOSES

#### REMOVAL

The removal and replacement of both front and rear brake pressure hoses is a straightforward operation. However, there are some safety points to remember.

1. Examine all flexible pipes for signs of rubbing, deterioration, bulging etc, at regular intervals. IF IN DOUBT REPLACE THE PIPE. Wherever possible renew copper sealing washers.

#### NOTE:

If sealing washers are to be used again, they can be 'annealed' by heating to a cherry red colour and plunging into cold water. All flexible brake pipes have a marker line running their length, this is to facilitate correct alignment of the pipe which must not be twisted.

#### WARNING

#### FLEXIBLE BRAKES HOSES

Ensure that the flexible brake hoses are not twisted and do not stretch or kink during operation of the front forks at the extreme limits of movement.

2. Bleed the system thoroughly with the correct grade of hydraulic fluid. Exercise extreme care when tightening banjo bolts, unions etc as they are hollow and are easily sheared.
3. Examine pipes very carefully for leaks, bulges etc under maximum braking effort.
4. Check there is no fluid loss at any of the joints. To rectify any leak, close off the joint and replace the affected pipe or copper washer. Bleed the system as detailed in Section F3.

## SECTION F6

### BRAKE ADJUSTMENTS

Hydraulically operated disc brakes are fitted to the front and rear wheels of this machine and, as they are self compensating for wear, no adjustment of the brake systems is possible. However, adjustment of the rear brake pedal position is possible. There are two means of adjustment for the rear brake pedal.

1. The pedal can be removed from the splines of the pivot shaft and moved one spline at a time to the required position.
2. The brake master cylinder actuating rod (situated behind the right footrest mounting plate) can be screwed in or out to provide brake pedal height adjustment.

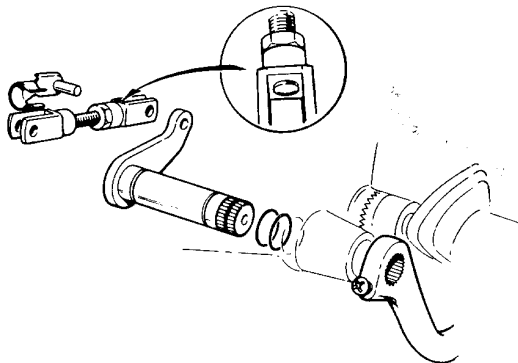


Fig. F6. Rear Brake and Pedal Adjustment

To adjust the rear brake actuating rod remove the right footrest mounting plate as described in Section E20, slacken the locknut on the actuating rod, detach the pivot pin clip at the

forward end and withdraw the pivot pin. Rotate the fork end to move it along the actuating rod. The normally assembled position of the actuating rod is with the rod end flush with the fork end tapped holes, and allowable adjustment is plus or minus two threads. When the required adjustment has been achieved, refit the pivot pin and clip, and re-tighten the locknut. Continue re-assembly of the footrest plates.

#### WARNING

**ADJUSTMENT OF THE REAR BRAKE MASTER CYLINDER ACTUATING ROD.** The normal position of this rod is flush with the fork end tapped holes and adjustment is plus or minus two threads at each end. Over adjustment could result in either the actuating rod threaded ends protruding too far into the fork ends bringing them into contact with the brake pedal lever and causing the mechanism to lock, or the rod could be adjusted too far back leaving insufficient threads engaged in the fork ends. These could strip and cause the rear brake not to function during braking. Following any brake adjustment ensure that the rear brake operates normally and that the brake pedal does not foul the silencer heat shield.

#### BRAKE PEDAL PAD ADJUSTMENT

The aluminium footbrake pedal pad is detachable, being fixed to the pedal arm by two stainless steel cap headed screws. The pedal pad incorporates three threaded fixing holes, and being offset to the centreline of the pad, allows fitment in four alternative positions to suit the riders convenience.

## SECTION F7

### FRONT BRAKE MASTER CYLINDER

#### Master Cylinder – Description

The master cylinder body is cast in light alloy, comprising a cylindrical body and a piston fitted with seals ensuring oil tightness. The piston incorporates an extension against which the operating lever thrusts, return being controlled by a spring and buffer. A retaining ring, scraper seal and lock-ring prevent ingress of water and foreign matter into the body of the master cylinder.

The operating lever pivots on the master cylinder casting, incorporating an adjuster screw controlling the relative location of the piston and lever. The clearance should be set between 0.05 and 0.15 mm. Clearances greater will allow lever rattle, less will prevent hydraulic fluid transfer from the master cylinder itself.

The transparent reservoir is fixed to the body casting by means of a clamping plate and lock screw compressing a sealing 'O' ring into position. A bellows type seal fits in the reservoir top, preventing escape of fluid and entry of dirt, damp etc. and is held in place by the plastic cap.

#### General Maintenance – Checking and Testing

Check the level of the fluid in the reservoir frequently. Never allow the level to fall below the minimum indicated. Top up as required from a clean new can of the specified fluid – replace the caps on both the can and the master cylinder reservoir as soon as practicable, as brake fluid is hygroscopic.

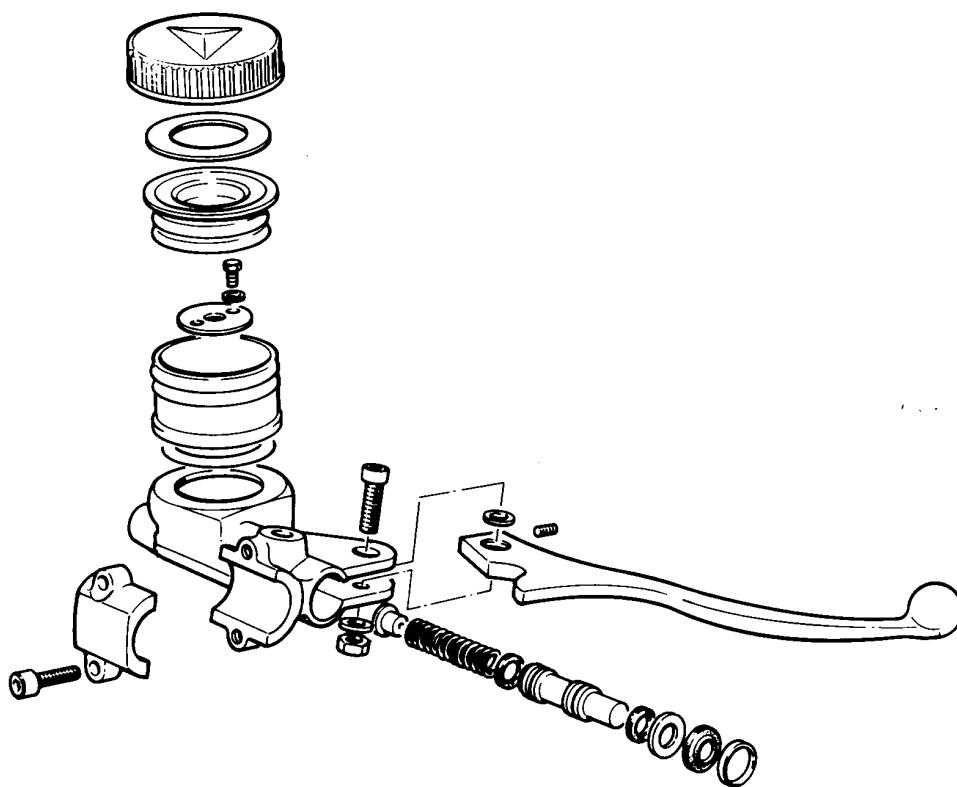


Fig. F7. The Front Brake Master Cylinder

Change the fluid every 12,000 miles (20,000 km) or every year whichever occurs first. The volume of fluid required from the front brake system is 150cc.

Check the prescribed lever gap (see above – “Description”) is between 0.05 and 0.15 mm. Always flush out the system using the actual specified fluid.

Not alcohol or other fluid.

Never dry out the system using compressed air.

Periodically lubricate the sealing ring seal by applying Castrol BNG grease to the piston thrust abutment. Under no circumstance whatsoever should oil or mineral grease be used for this application.

Periodically also lubricate the contact zone between the piston and the lever with molybdenum disulphide grease.

#### **General Rules for Stripping Brake Parts**

Prior to dismantling and stripping the brake system, completely clean all the external parts. Seal the ends of the pipework to prevent entry of foreign bodies. Following dismantling, clean all items in trichlorethelene, and rubber items in ethyl alcohol. Note that ‘trike’ must never come into contact with rubber seals.

Precision components must be handled with care to avoid damage. After cleaning, dry carefully with fluff free cloth, and moisten cylinder walls and piston surfaces with brake fluid to protect from corrosion.

#### **Overhauling and Replacement of Components**

In cases where master cylinder faults have occurred (e.g. loss of fluid or reduction in braking efficiency) the seals should be

replaced as follows:

- i Syphon the fluid from the reservoir with a syringe.
- ii Detach and seal fluid feed pipe.
- iii Remove pivot and lever.
- iv Insert flat ended drift into the fluid exit hole and gently tap the piston out of the cylinder being careful not to damage the internal walls of the master cylinder.
- v Collect from the piston the scraper seal ring, lock washer and lock ring.
- vi Remove the spring and guide buffer.
- vii Clean carefully the piston and master cylinder, ensuring the components are not damaged.
- viii Check the seals, and where necessary using a suitable tool remove from the piston the old seals without damaging the piston grooves. Note the seal lip location and direction prior to removal.
- ix Fit the replacement seals ensuring the pressure lips are facing in the correct direction (i.e. seal lips towards fluid exit hole).
- x Assemble onto the piston rear extension, the lockwasher, the scraper seal ring (checking it is not damaged and the lip is in good condition) and the locking ring in that order.
- xi Thread onto the piston the return spring and its guide buffer. Slightly smear the master cylinder bore and the piston and seals with CASTROL BNG grease and offer into the master cylinder bore. Re-set the lock ring using a hollow drift until the lockwasher is felt to be fully home.
- xii Change as necessary any copper washers, re-fit the hose to the master cylinder (recommended torque 13/16 lb.ft (1.80 KG.M). Re-assemble the lever and pivot and reset the adjuster screw to the dimensions given above in ‘General Maintenance’.
- xiii Refit reservoir with the recommended fluid (DOT4) and bleed the system as necessary (Section F3).



## SECTION F8

### REAR BRAKE MASTER CYLINDER

#### Master Cylinder – Description

The master cylinder body is cast in light alloy, comprising a cylindrical body and a piston fitted with seals ensuring oil tightness. The piston incorporates a rear extension against which the brake cylinder lever thrusts, return being controlled by an internal spring and buffer. A retaining ring, scraper seal and lock ring prevent ingress of water into the body of the master cylinder.

The operating lever pivots within integral lugs on the master cylinder casting actuated by the footbrake lever to which it is connected by means of an adjustable brake rod. (See Section F6).

The transparent fluid reservoir is remotely mounted on the right side of the machine beneath the seat, and connected by feed pipe to an elbow union located within the master cylinder body by a retaining grommet. The reservoir incorporates a bellows type seal which fits in the reservoir top preventing escape of fluid and entry of dirt, damp etc. and is held in place by the plastic cap.

#### General Maintenance – Checking and Testing

Check the level of the fluid in the reservoir frequently. Never allow the level to fall below the minimum indicated. Top up as required from a clean new can of the specified fluid – replacing the caps on both the can and reservoir as soon as possible as brake fluid is hygroscopic.

Change the fluid every 12,000 miles (20,000 km) or every year, whichever occurs first. The volume of fluid required for the rear brake system is 100 cc approximately.

When flushing out the system, use only the specified brake fluid. Do not use alcohol or other fluids, and never attempt to purge or dry out the system using compressed air.

Periodically lubricate the rear brake lever pivots with engine oil, ensuring no traces are transferred to the rear piston scraper seal

assembly. Anti-friction molybdenum disulphide grease should be used to lubricate the contact zone between the piston extension thrust rod and the lever when circumstances permit.

#### General Rules for Stripping Brake Parts

Exactly the same rules apply when stripping the rear master cylinder as detailed in Section 7 for the front master cylinder.

Additional attention must be paid to protecting the cleanliness of the remote reservoir feed pipe and caliper hose connections in view of their close proximity to the rear wheel and tyre.

#### Overhauling the Rear Master Cylinder

Remove the right footrest mounting plate and brake actuating rod as described in Section E20. Remove the master cylinder from the mounting plate as follows:

- i Syphon the fluid from the reservoir with a syringe.
- ii Detach and seal the fluid feed pipe at the master cylinder end.
- iii Disconnect the brake light leads.
- iv Disconnect rear brake hose banjo bolt and seal off caliper feed hose.
- v Remove the brake light switch and banjo union.
- vi Undo two M6 x 25 bolts and detach rear master cylinder.
- vii Remove one circlip, remove the brake lever.
- viii Insert a round flat ended drift into the fluid exit hole and gently tap the piston out of the cylinder, being careful not to damage the internal walls of the master cylinder.
- ix Collect from the piston the scraper seal ring, lock washer and lock ring.
- x Remove the spring and guide buffer.
- xi Clean carefully the piston and master cylinder ensuring the components are not damaged.

## SECTION F9

### STRIPPING AND RE-ASSEMBLING THE BRAKE CALIPER

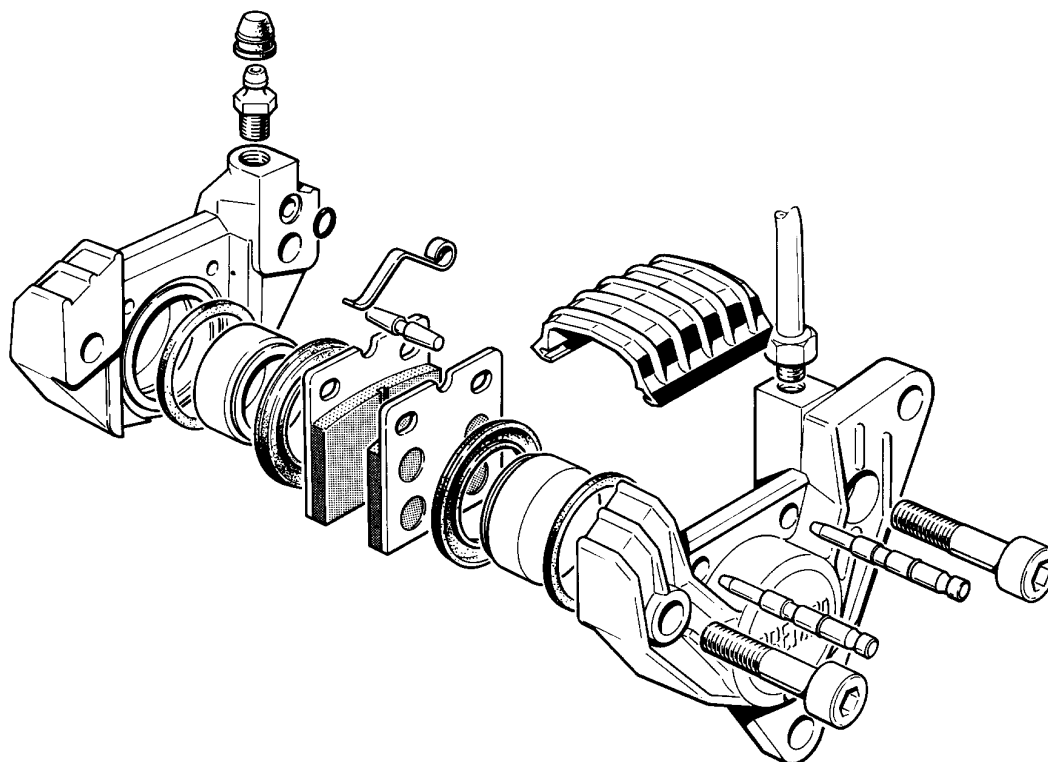


Fig. F9. Exploded View – Brake Caliper Assembly

#### Description

The caliper comprises two halves cast in light alloy and bolted together with two screws. In each half caliper is a cylindrically bored housing machined as a guide for the piston. Sealing between the piston and caliper is made by a rubber seal housed in a groove machined into the cylinder bore. Adjustment for pad wear occurs automatically, since with gradual wear on the pads the pistons continue to emerge from the cylinders.

A dust seal fixed to annular shoulders on the piston and cylinder bore prevent ingress of damp and foreign matter. The pistons work directly on the two brake pads which are held in position by two locating pins and shorter pin complete with an anti-rattle spring to prevent relative movement.

An inspection cover which clips in position prevents water and dirt entering the caliper and pad enclosure.

Supply of brake fluid is achieved via the threaded hole machined in the caliper body at the mounting lugs, the two caliper halves being connected by internal holes, with 'O' ring oil sealing between. One half caliper is provided with a bleed nipple to assist in the elimination of air bubbles.

#### Replacement of Components

Component replacement will prove to be necessary if fluid is visible around the caliper pistons or disc, with accompanying fluid loss from the reservoir. To change the seals proceed as follows:

Drain the system by opening the caliper bleed nipple (having connected a pipe from the nipple to a fluid container) and operating the brake lever until no further fluid flows. Repeat for the second caliper in the case of the front brake. Care must be taken during the following sequence to prevent any residual fluid falling onto paintwork, tyres or other parts of the

machine. If this does unfortunately occur, the affected parts must immediately be washed thoroughly in copious supplies of hot soapy water.

- a Remove and seal the brake pipes.
- b Remove the caliper.
- c Prise the cover out of position.
- d Remove the pin and spring locating the pads.
- e Remove the locking pins and pads.
- f Strip the caliper into two halves (Fig. F9).
- g Remove the dust seal from the half caliper which exhibits the leak.
- h Remove the piston from the half caliper using compressed air, taking great care to do this gradually. Do not scratch the piston or bore surfaces when withdrawing the piston.
- i Remove the defective seal from its groove using a sharpened rod or pin, being careful not to damage the shoulders of the groove.
- j Clean the piston.
- k Fit a new replacement seal – finger pressure only.
- l Lightly smear Castrol BNG grease over the seal and piston sides prior to assembly.

- m Refit the piston and relocate the dust excluder (replace if torn or damaged) locating properly in both piston and cylinder.
- n Bolt up the two halves of the caliper, checking the joint 'O' ring seal is securely located on its seat.
- o The two large screws should be replaced by new screws prior to torquing up to 30/33 lb ft (4.15/4.56 Kg m).
- p Re-fit the caliper. The mounting screws should be torqued up to 30/33 lb ft (4.15/4.56 Kg m).
- q Re-fit the brake pads, retaining pins and the short spindle with the pad locating spring clip. Replace any pin exhibiting any signs of rust or corrosion.
- r Re-connect the brake pipe (10/12 lb ft – 1.38/1.70 Kg m).
- s Bleed the system as described in Section F3 "Bleeding the Hydraulic System".

## WARNING

The only satisfactory remedy for a siezed piston is renewal of the affected caliper assembly.

## SECTION F10

### REMOVING AND REFITTING THE FRONT WHEEL

#### REMOVAL

Place the machine on its centre stand and placing a stout support under the engine, disconnect the speedometer drive cable from the drive gearbox. Remove both front brake calipers and support them as shown in Fig. F10 – do not allow any strain to be put on the brake pipes. Place a piece of wood or similar packing between the brake pads and remember not to operate the front brake lever whilst the front wheel is removed. Release the spindle clamp bolt, undo the spindle nut and draw the spindle out of the wheel and forks. Remove the wheel.

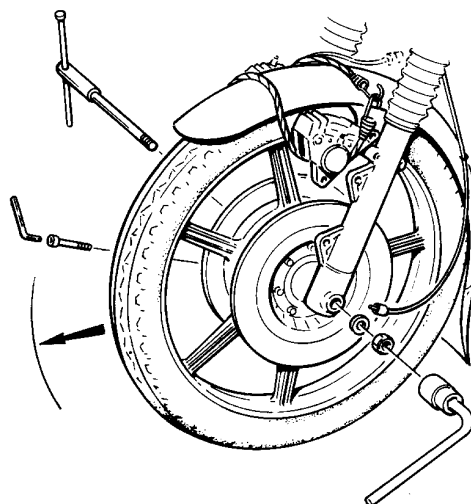


Fig. F10. Removing the Front Wheel

#### REFITTING

Refitting is the reverse of removal but there are a couple of points to watch. Ensure that the wheel spindle is clean and that the speedometer cable is fitted correctly. Grease the spindle lightly before fitting. Before tightening the spindle nut and clamp bolt, take the machine off the centre stand and push the machine forward, apply the brakes to centralise the forks and tighten the spindle nut and clamp bolts. Torque load the spindle nut to 80/100 lbs. ft. (13.8 kg M).

#### NOTE:

The speedometer cable must be routed inside the left side front brake pipe, to avoid any possibility of subsequent contact or abrasion.

## SECTION F11

### REMOVAL AND REPLACEMENT OF THE FRONT WHEEL BEARINGS

#### REMOVAL

Remove the front wheel as described in Section F10 and remove the speedometer drive gearbox body and seal. Extract the speedometer drive gear and withdraw spacer. Remove the discs by releasing the six bolts on either side of the wheel. Move the internal spacer to one side, and very carefully drift out the bearing from the left side. Turn the wheel over and repeat for the RH bearing. Inspect for any damage and replace where necessary. Examine the hub casting for cracks and the speedometer gearbox body for similar signs.

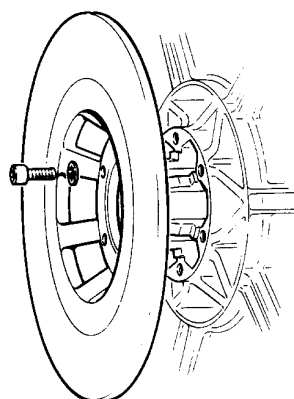


Fig. F11. Removing the Front Wheel Brake Discs

**DISCS**

The discs must be free of all surface imperfections, and if scored must be replaced to maintain braking efficiency. Max. allowable disc run out is 0.15 mm (0.006 in.).

**REASSEMBLY**

Fit the RH bearing and locating circlip. Turn the wheel onto its right side and fit the bearing spacer tube. Fit the LH bearing and the spindle to locate the spacer tube before pressing home the bearing. Fit the seal into the speedometer drive gearbox. Fit the washer next to the bearing, grease the speedometer gearbox and refit.

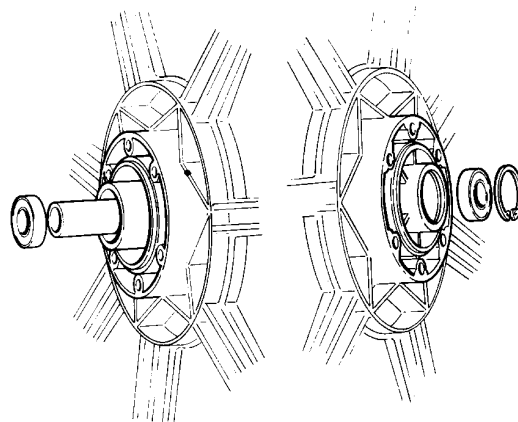


Fig. F12. Removing and Replacing the Front Wheel Bearings

## SECTION F12

### REAR WHEEL REMOVAL AND REPLACEMENT

**REMOVAL**

With the machine on the centre stand unscrew the rear mudguard 'camloc' fasteners ('Push turn' – anti-clockwise) and lift the rear mudguard. There is a stainless steel clip to retain it in the 'up' position. Remove the rear brake torque arm from the rear brake caliper mounting plate. Remove the wheel spindle from the right side and suspend the brake caliper from the grab rail with the caliper service hook. (As shown in Fig. F13). Note how the distance pieces are removed (for refitting). Pull the wheel to the right to clear the cush drive rubbers and roll the wheel out from the swinging fork.

**REPLACEMENT**

Refitting is the reverse. Ensure, however, that the wheel spindle is clean and lightly greased. To assist fitting the vanes in the rear wheel into the driver rubbers, apply silicone grease (or if not available apply liquid soap to the rubbers prior to assembly).

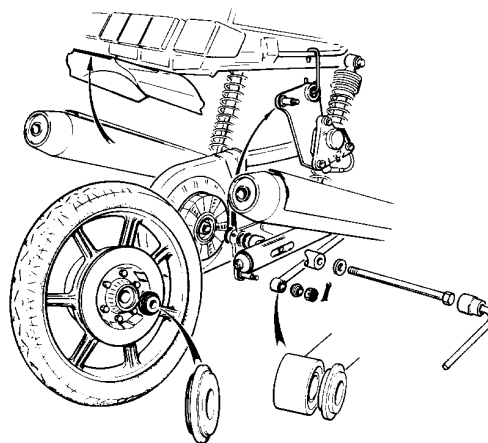


Fig. F13. Rear Wheel Removal and Replacement

Locate the drive vanes in the cush drive and fit the spacers in the correct order. See Fig. F13. Torque load spindle to 80/100 lb. ft. (13.8 kg M).

## SECTION F13

### REMOVING AND REPLACING THE REAR WHEEL BEARINGS

Remove rear wheel as described in Section F12. On the disc brake side of the wheel (RH) remove the internal circlip and remove the six bolts securing the brake disc. Remove the brake disc. Move the internal spacer to one side and very carefully drift out the bearing from the left side. Turn the wheel over and repeat the operation on the RH bearing. Wash

the components and carefully examine the bearings for wear, damage, discolouration etc and replace where necessary. Always replace wheel bearings in pairs. Assembly is the reverse of dismantling.

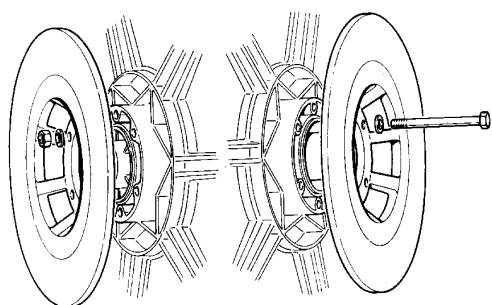


Fig. F14. Removing and Replacing the Rear Wheel Brake Discs

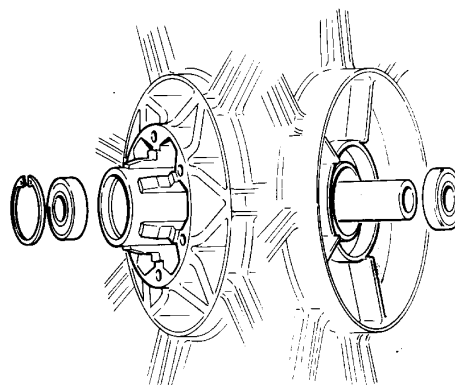


Fig. F15. Removal and Refitting the Rear Wheel Bearings.

## SECTION F14

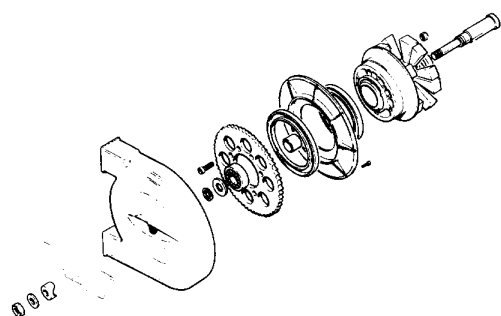
### REMOVING & REPLACING THE REAR DRIVE SPROCKET ASSEMBLY

Remove the rear wheel complete as described in Section F12. Drain the lubricating oil from the rear drive chaincase by removing the drain plug in the bottom of the sprocket housing (section A9). Remove the top and bottom chain gaiter clips and push forward the top gaiter to give access to the driving chain split link. (Fig. D9) Remove the spring link and pull the chain up through the bottom of the rear sprocket housing. Wire the ends of the chain together to retain the chain around the gear-box sprocket and to prevent accidental removal. Now is a good opportunity to examine the chain gaiters for splits or cracks and leaks.

Replace both gaiters if one is worn or damaged as, if one is worn then the other will very probably be equally worn. Remove the spindle nut and withdraw the hub unit complete with rubber cush drive from the swinging arm assembly.

#### DISMANTLING

Remove the rubber cush drive from the hub assembly and, removing the ten screws, take off the outer hub cover. Remove the 'O' ring and washer from the spindle. Unscrew the five bolts securing the sprocket to the hub and remove the sprocket. Remove the inner



**Fig. F16. Replacing the Rear Wheel Drive Sprocket.**

sprocket cover and oil seal, but do not attempt to remove the pressed metal cover from the hub. Draw the inner bearing, spindle and spacer tube from the hub, and noting the position of the outer thrust bearing, draw it out of the hub. Wash carefully in de-greasing solution and examine all bearings and oil seals for damage, wear etc, and replace where necessary. Examine the cush drive rubber for wear and deterioration, and replace if necessary.

#### **NOTE**

Pay particular attention to the condition of the large oil seal. This should be replaced if the slightest sign of oil leakage is found. When fitting a new seal, run a narrow bead of clear silicone sealer around the base of the oil seal housing to prevent oil leakage past the outside of the seal.

#### **REASSEMBLY**

Gently heat the hub to approximately 85°C

and place the shock absorber vane face on a firm flat surface.

Press the angular contact thrust bearing fully home to the shoulder within the pre-warmed hub ensuring the thicker end of the outer race is assembled inwards towards the centre of the hub. Turn the hub over and support it on the inner race of the angular contact bearing and enter the spacer tube prior to pressing the double sealed face ball bearing into the housing until the spacer tube prevents further movement. Smear a film of chaincase oil (Section A2) round the hub spigot and fit the inner sprocket cover and oil seal assembly over the spigot. Fit the sprocket to the hub and torque load bolts to the recommended setting. After assembling the spindle through the bearings fit the abutment washer and sealing 'O' ring onto the spindle. Smear clear silicone sealer onto the sprocket inner and outer cover faces and assemble to cover. Pull up the ten screws evenly and tightly. Thinly coat the cush drive rubber with silicone grease and refit it to the hub. Slacken off the chain tensioner and feed the chain through the hub assembly, turning the cush drive to pull the chain through. Refit the spring link with the closed end in the direction of travel. Refit the hub unit to the swinging arm. Seal the chain gaiter ends with clear silicone sealer and new gaiter clips. Refit the rear wheel (Section F12). Replenish the rear chain oil bath with correct amount of the recommended lubricant (Section A2). Adjust the final drive chain (Section D10) and align the wheels (Section F19).

## **SECTION F15**

### **TYRE MAINTENANCE**

#### **CHECKS DURING USE.**

Check the tyre pressure daily and examine for cuts etc. over the whole of the tyre surface. Misalignment of the wheels, a twist in the frame or forks and worn wheel bearings or steering head bearings can all affect the wear characteristics of the tyres, it is therefore important to maintain the cycle parts in good working order.

When new tyres are to be fitted the wheels should be balanced after fitting the tyres as an out of balance tyre can adversely affect the handling qualities of the machine.

Have the tyres inspected by an expert if, at any time they have been subjected to any form of violent impact (e.g. hitting kerb), as although

the tyre may appear undamaged on the outside, it may have received internal damage not immediately noticeable to the untrained eye.

When checking tyres remove any small stones and foreign objects that may have become embedded in the tyre. **IT IS BETTER TO LOCATE A PUNCTURE WHILST REMOVING SHARP OBJECTS FROM THE TYRE PRIOR TO RIDING THE MACHINE THAN TO HAVE THE SAME OBJECT CAUSE A HIGH SPEED 'BLOW' OUT.**

Should the tyres become contaminated at any time with oil, grease or especially brake fluid, the contaminant should be scrubbed off **immediately** with hot, soapy water. If in doubt as to the serviceability of the tyre after contamination consult a tyre expert.

#### TYRE PRESSURES

The Technical Specification lists the recommended tyre pressures for use on this machine and great importance is attached to the advice

given. Failure to follow the advice given on tyre pressure could result in an adverse effect on the grip, wear and handling qualities of the tyres and may result in deterioration of the machine's handling characteristics, to the extent that an accident may result. Always check pressures when the tyres are cold as road usage raises the tyre temperature and, consequently tyre pressures. When undertaking a long high speed journey raise the tyre pressures by 4 p.s.i. (0.3 bar) front and rear (cold). **NEVER ON ANY OCCASION EXCEED 50 p.s.i. (COLD) IN ANY TYRE.**

#### WEAR INDICATORS

These are narrow lateral 'bumps' at the base of the tread grooves which appear at the surface when the groove depth is reduced to 0.8 mm (approx). The wear indicators are spaced evenly around the circumference of the tyre in at least three places. The tyre should be replaced before the tread wear reaches this point.

## SECTION F16

### SELECTION OF REPLACEMENT TYRES

When selecting replacement tyres for this machine it is important to remember the performance capabilities inherent in the design. This machine is a high performance vehicle and it is essential to use 'V' rated tyres as only tyres of this speed rating or higher will withstand the stresses encountered in high speed motoring. 'V' rate is for speeds above 130 mph (210 KM/H).

Load capacity is another important consideration and the tyres being selected must have a greater load capacity than will ever be encountered on the machine fully loaded with luggage and all accessories. Ensure that the tyre cross section will not contact any cycle part during use. Checks must be made when fitting a tyre of differing make to the original equipment to ensure that, with the suspension fully compressed front and rear, there are no contact areas with cycle parts. Remember also that a tyre will tend to 'grow' (that is, the tyre diameter will become larger due to rotational

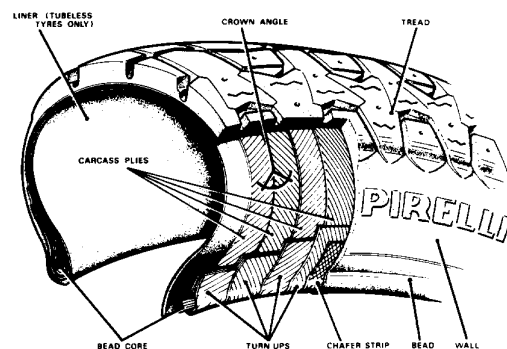


Fig. F17. Cross Section of 'V' Rated Tyre

forces and an increase in temperature) at speed on the road, and this could result in the incorrect tyre contacting the cycle parts.

In view of the performance capabilities of this machine we recommend that only matched pairs of tyres be fitted. Some high speed tyres, although of good quality and performance may not give their best when fitted to a machine



which does not have matching tyres. This 'mis-matching' of tyres can result in instability at high speeds and a general loss in handling performance.

#### **WARNING**

IF YOUR MACHINE HAS TUBED TYPE TYRES SPECIFIED AS ORIGINAL EQUIPMENT DO NOT ATTEMPT TO FIT TUBELESS TYRES AS THE WHEELS MAY BE UNSUITABLE.

## **SECTION F17**

### **REMOVING AND REFITTING TYRES**

To remove the tyre first remove the valve cap and valve core, using the valve cap itself to unscrew the core. Unscrew the knurled valve securing nut and then place all parts where they will be free from dirt and grit. It is recommended that the cover beads are lubricated with a little soapy water before attempting to remove the tyre. The tyre lever should be dipped in this solution before each application. First insert a lever at the valve position and whilst carefully pulling on this lever, press the tyre bead into the well of the rim diametrically opposite the valve position (see Fig. F18). Insert a second lever close to the first and prise the bead over the rim flange (Fig. F19). Remove the first lever and reinsert a little further round the rim from the second lever. Continue round the bead in steps of two or three inches until the bead is completely away from the rim. Push the valve out of the rim and then withdraw the inner tube. To completely remove the tyre first stand the wheel upright and then insert a lever between the remaining bead and the rim. The tyre should be easily removed from the rim.

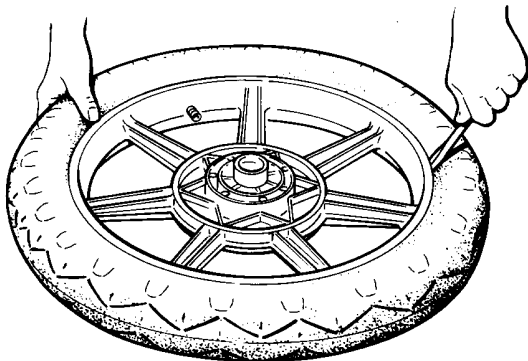


Fig. 18. Inserting the First Tyre Lever

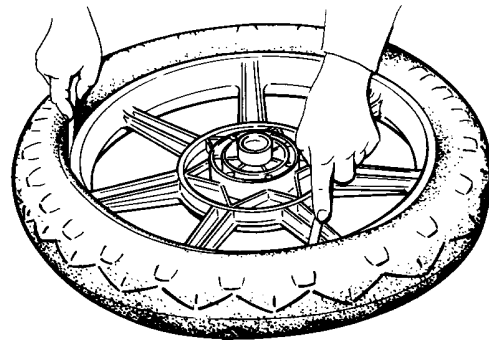


Fig. 19. Inserting the Second Tyre Lever

#### **REFITTING THE TYRE**

Replace the inner tube valve core and inflate the tube sufficiently to round it out without stretch, dust it with french chalk and insert in into the cover with the valve located at 180° opposite the cover 'balancing spot' leaving it protruding outside the beads for about four inches either side of the valve.

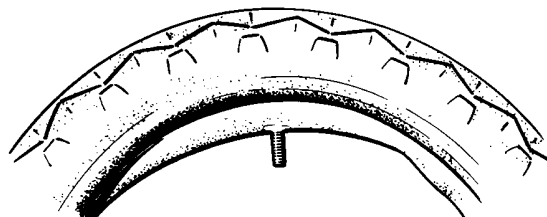


Fig. 20. Cover and Tube Assembled Ready for Fitting

**NOTE**

The instruction applies to the Pirelli Phantom tyres fitted as original equipment. For alternative manufacture replacement tyres, always read and comply with the manufacturers fitting instructions.

At this stage it is advisable to lubricate the beads and levers with soapy water.

Squeeze the beads together at the valve position to prevent the tube slipping back inside the tyre and offer the cover to the rim, as shown in Fig. F21. At the same time threading the valve through the valve hole in the rim.

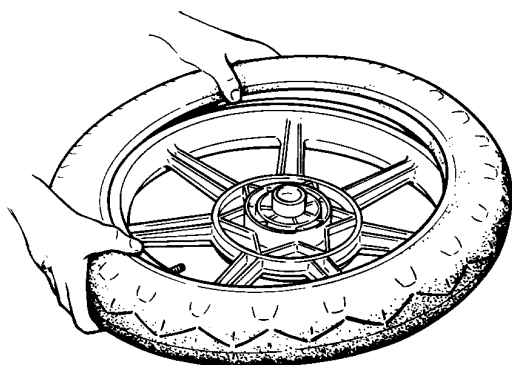


Fig. F21. Refitting the Tyre to the Wheel.

Particular attention must now be given to the direction of travel arrows moulded into side of the tyre indicating the direction of rotation of the tyre when fitted, according to whether fitted to front or rear wheel.

Allow the first bead to go into the well of the rim and the other bead to lie above the level of the rim flange.

Working from the valve, press the first bead over the rim flange by hand, moving forward in small steps and making sure that the parts of the bead already dealt with, lies in the well of the rim. If necessary use a tyre lever for the last few inches, as shown in Fig. F22. During this operation continually check that the inner tube is not trapped by the cover bead.

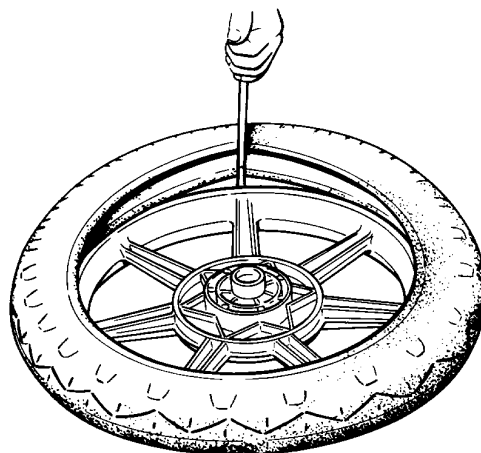


Fig. F22. Levering on the First Bead

Press the second bead into the well of the rim diametrically opposite the valve. Insert a lever as close as possible to the point where the bead passes over the flange and lever the bead into the flange, at the same time pressing the fitted part of the bead into the well of the rim. Repeat until the bead is completely over the flange, finishing at the valve position (see Fig. F23).

Push the valve inwards to ensure that the tube near the valve is not trapped under the bead. Pull the valve back and inflate the tyre. Check that the fitting line on the cover is concentric with the top of the rim flange and that the valve protrudes squarely through the valve hole. Fit the knurled rim nut and valve cap. The tyre pressure should then be set to the figure given in General Data. Before refitting either wheel to the machine it must be checked for balance (Section F20).

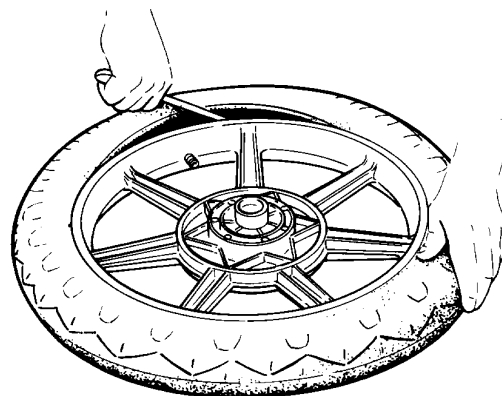


Fig. F23. Levering on the Second Bead

## SECTION F18

### TYRE REPAIRS

As this machine has very high performance capabilities we do not recommend repairs to the tyres or inner tubes. In the event of damage to the tyre the affected tyre and inner tube should be replaced, repairs to the tyre or

inner tubes should be carried out only as an emergency 'get you home' measure. When riding on a repaired tyre keep the speed down and replace the affected tyre as soon as is practicable.

## SECTION F19

### FRONT AND REAR WHEEL ALIGNMENT

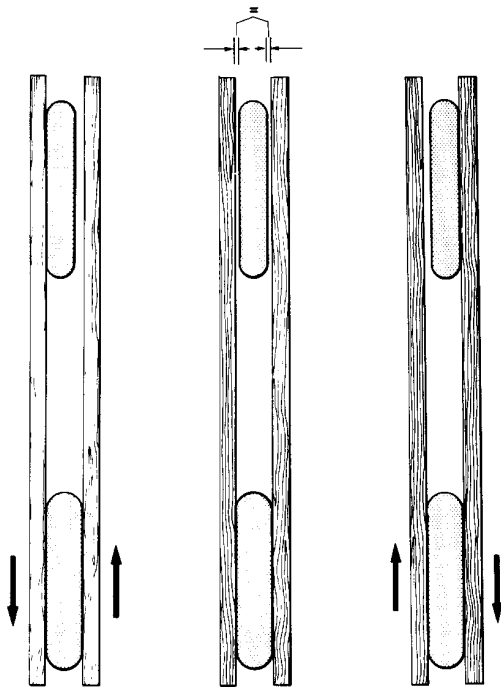


Fig. F24. Front and Rear Wheel Alignment

When the rear wheel has been fitted into the frame it should be aligned correctly by using two straight edges or 'battens' about 7 feet (2 M.) long. With the machine off the stand the battens should be placed along-side the wheel, one either side of the machine and each

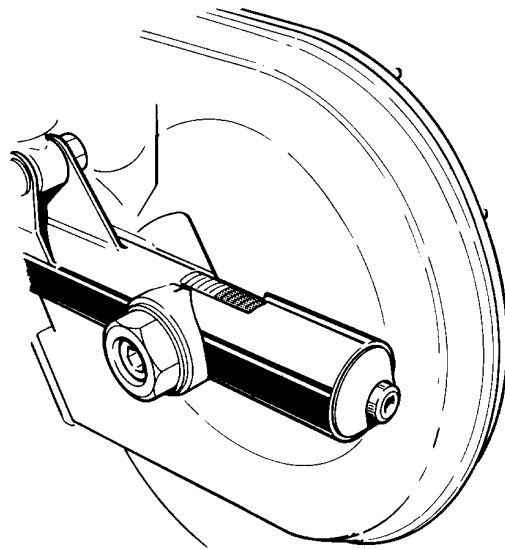


Fig. F25. Maintaining the Rear Wheel Spindle Adjustment

about four inches above the ground. When both are touching the rear tyre on both sides of the wheel the front wheel should be midway between the parallel with both battens. (allowing for the difference of width of front and rear tyres). Position the front wheel so that this can be seen. Any necessary adjustment must be made, by first slackening the rear wheel spindle nuts, then turning the spindle adjuster screws (Fig. F25) to achieve front and rear wheel alignment ensuring that the correct rear chain adjustment is maintained. See Section D10 "Adjusting the Rear Chain".

## **SECTION F20**

### **WHEEL BALANCING**

Following renewal or refitting of a tyre to a wheel, the overall balance of the wheel and tyre must be checked and corrected where necessary.

Mount the wheel on a horizontal spindle allowing it to rotate freely on its own bearings. Gently spin the wheel and allow it to stop, marking with chalk the highest point at which the spinning stopped. Repeat the procedure and if the wheel constantly returns to the same position, it will require balancing.

Remove any existing weights and repeat the above procedure, fit to the rim of the wheel at the lightest (highest) point a weight restraining clip, and fit a weight. Repeat the test procedure and should the wheel return to the original position more weight at the top is required. If it swings to the bottom, less weight is needed. When the wheel is in balance it will stop in any position.

If more than 20 grms. are required to balance the wheel it is recommended that two smaller weights are used in preference to one large one.