

# **WINGET**

## **OPERATING INSTRUCTIONS & SPARE PARTS LIST**

### **FOUR A 50E DIESEL DUMPER (CAPACITY 50 CWT)**

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## **INTRODUCTION**

This Parts & Operators Manual is a re-print of the manual last published in 1981 and contains some amended part numbers.

Health & Safety legislation and working practices applicable to Site Dumpers, both 2 and 4 wheel Drive, Rigid Chassis and Articulated Chassis have changed considerably in the years since this manual was last published and immediately following this Introduction are notes on the Safe Use of Site Dumpers. These notes supersede and replace all previous 'Dumper Safety' notes issued with Winget FOUR A 50E Four Wheel Drive Dumpers.

Reference is made on a number of pages to 'bolt c/w nut and washer', this no longer the case, fixings such as nuts, bolts, screws and washers should be ordered as individual items. A number of Whitworth and B.S.F fixings are now no longer available, in these cases the nearest metric equivalent size will be supplied.

The contents of this manual although correct at the time of publication, may be subject to alteration by the manufacturers without notice and Winget Limited can accept no responsibility for any errors or omissions contained within the following pages. Nor can we accept any liability whatsoever arising from the use of this manual howsoever caused.

Winget Limited operate a policy of continuous product development. Therefore, some illustrations or text within this publication may differ from your machine.

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# DUMPER SAFETY

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**Safety is the responsibility of all persons working with this machine. Think "safety" at all times. Read and remember the contents of this handbook.**

## MACHINE MODIFICATIONS

**WARNING** Any modifications to the machine will affect its working parameters and safety factors. Refer to the Manufacturers before fitting any non-standard equipment or parts.



The Manufacturers accept no responsibility for any modifications made after the machine has left the factory, unless previously agreed by the Manufacturers in writing; the Manufacturers will accept no liability for damage to property, personnel or the machine if failure is brought about due to such modifications, or fitment of spurious parts.

## TRAINING

**WARNING** Only trained operators should use this machine.



Operators should hold an appropriate full motor vehicle driving licence and undergo both a safety awareness course and a driver training course for Site dumpers run by the C.ITB or equivalent body leading to the award of a CTA.

It is strongly recommended that operators read the H.S.E. publication "Safe Working with Small Dumpers" which is available from government bookshops (HMSO) or from other bookshops quoting the following number ISBN 011 8836935. Another useful publication is British Standard number BS 6264, "Procedure for Operator Training For Earth Moving Machinery" available from the British Standard Institution.

## OPERATION

**WARNING** *NEVER* use the machine for purposes other than those for which it was designed. This machine was designed to carry loads such as soil, clay, sand, wet concrete, stone or other similar materials. It was not designed to carry loads which may move around in the skip uncontrollably, nor to carry any loads or materials which overhang the skip in any way. If in any doubt as to the suitability of this machine for a particular task, contact your nearest Distributor or the Manufacturer for advice.



*ALWAYS* be aware of local and national regulations governing the use of the machine.

*NEVER* commence work with the machine until the "Daily (or every ten hours)" service checks have been made. (*See Service Section for details*)

*ALWAYS* check wheel nut tightness daily.

*NEVER* carry passengers.

Where seat belt restraints are fitted as part of Rops/Fops Protection they must be worn. Ensure that the seat and seat belt are securely fixed to the machine. Check that the seat belt is in good condition, free from cuts and frayed edges.

*ALWAYS* remain in the driving seat whenever the engine is running. Never attempt to operate any controls unless seated.

*ALWAYS* apply the parking brake before leaving the driver's seat.

## DUMPER SAFETY

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*NEVER* dismount with the engine running, and never leave the machine unattended with the key in the starter switch.

When Battery Isolators are fitted they must be activated only when the engine is turned off except in cases of emergency.

Activating a Battery Isolator when the engine is running can result in damage to the electrical components and circuits.

*NEVER* fill the fuel or hydraulic tanks with the engine running.

*ALWAYS* drive only on surfaces that are known to be stable.

*ALWAYS* keep the floor plates and walkways clean.

*NEVER* drive the machine close to the edge of any excavation. Always use effective wheel stops to prevent the machine running close to the edge. Make sure that the stops are in proportion to the size of the wheels and are set sufficiently far enough back from the edge of any excavation to prevent the weight of the load causing a collapse.

*NEVER* adjust the tyre pressures in an attempt to improve traction on soft ground or obtain a softer ride on hard ground. Incorrectly adjusted tyres can affect the steering and handling characteristics.

*NEVER* attempt to free a machine which is 'bogged down' by pushing with the bucket of a backhoe loader, tracked excavator or other similar machine.

*NEVER* make unnecessary "crash stops" when travelling at speed, especially in forward direction.

*NEVER* work under an unpropped skip. *If the dumper was supplied with a special Skip Support always ensure that it is used.*

*Some articulating dumpers are manufactured with an articulation lock. If your machine has this feature proceed as follows:*

*ALWAYS* fit the articulation lock when working within the articulation point crush zone.

*NEVER* attempt to lift the machine unless the articulation lock is engaged.

## SKIPS AND LOADING

**WARNING** *NEVER* exceed the rated payload. The weights of all loads above skip water level must be checked.



*NEVER* remain on the machine when loading the skip with excavators or loaders. Stop the engine, apply the parking brake, dismount, and stand well clear.

*ALWAYS* ensure that the load is evenly distributed in the skip.

*NEVER* carry loads or heap materials in such a manner as to affect the forward vision.

*ALWAYS* take extra care when tipping non free running loads.

*NEVER* use the skip in a tipped position to bulldoze heaped materials level or to backfill material into excavations.

# DUMPER SAFETY

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## TOWING

**WARNING** NEVER attempt to start the engine of a dumper by towing or pushing.



Dumpers are not designed as towing vehicles, but loads (including weight of trailer) not exceeding the rated payload of the dumper may be towed on dry level ground in first gear, providing the dumper skip is loaded with half the rated payload to ensure tyre adhesion when braking.

ALWAYS use a purpose made towing pin.

NEVER tow loads up, down or across gradients.

## GRADIENTS

**WARNING** NEVER operate *Four Wheel Drive articulated steer dumpers* on any gradients which exceed 25% (1 in 4), or across gradients which exceed 16% (1 in 6).



NEVER operate *Two Wheel Drive rigid chassis dumpers* on any gradients which exceed 10% (1 in 10), or across gradients which exceed 10% (1 in 10).

ALWAYS remember that slippery or loose surface conditions can adversely affect safe machine operation, including braking, particularly on gradients.

ALWAYS choose routes that avoid steep, slippery or loose gradients.

NEVER coast down gradients. Always negotiate gradients in first gear.

ALWAYS drive forwards up gradients when loaded.

ALWAYS reverse down gradients when loaded.

ALWAYS keep the load facing uphill.

NEVER park on a gradient. If this is unavoidable, ALWAYS chock the wheels.

NEVER attempt to turn on a gradient.

NEVER tow up, down or across a gradient.

NEVER operate high discharge or rotating skips on gradients.

## HYDRAULICS

**WARNING** ALWAYS "Dump" residual pressure from the system before leaving the machine or before carrying out any maintenance or adjustments.



If maintenance work requires the skip to be in the raised position, then it must be raised and supported before dumping the pressure.

Dump pressure by switching off the engine, then moving the hydraulic control lever several times in each direction.

NEVER leave the machine unattended with pressure in the system.

ALWAYS purge hydraulic rams before commencing work. With the engine running operate the hydraulic control to fully extend and retract the rams.

ALWAYS practise the greatest cleanliness in maintaining hydraulic components.

# DUMPER SAFETY

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## SERVICING

**WARNING** ALWAYS report any defect at once, before an accident or consequential damage can occur.



ALWAYS conform to service schedules except where:

- 1 Warning lights or warning indicators call for immediate attention.
- 2 Adverse conditions necessitate more frequent servicing.

ALWAYS wear correctly fitting protective clothing. Loose or baggy clothing can be extremely dangerous when working on running engines or machinery.

ALWAYS, where possible, work on or close to engines or machinery only when they are stopped. If this is not practical, remember to keep tools, test equipment and all parts of your body well away from the moving parts.

ALWAYS dump pressure from the hydraulic system before carrying out any kind of maintenance or adjustment. (*see Hydraulics Warnings*).

ALWAYS avoid contact with exhaust pipes, exhaust manifolds and silencers when the engine is running; these can be very hot.

ALWAYS work out of doors, or in a well-ventilated area.

NEVER run an engine in an enclosed space. Exhaust fumes in enclosed areas can kill.

ALWAYS disconnect battery cables and remove battery before using an external charger, carrying out welding repairs or to prevent unauthorised usage when unattended or during a repair.

NEVER allow unqualified personnel to attempt to repair, remove or replace any part of the machine, or anyone to remove large or heavy components without adequate lifting tackle.

NEVER attempt to modify or repair Rops Frames or Fops Canopies by welding, drilling or any other means. Attempts to do so will invalidate Rops/Fops Certification.

ALWAYS obtain advice before mixing oils; some are incompatible. If in doubt drain and refill.

NEVER allow oils and fuels to come into regular contact with skin. This can lead to serious skin diseases including, medical evidence suggests, skin cancer. ALWAYS wear protective gloves when handling oils and fuels whether topping up, draining or refilling. ALWAYS wash hands if oils or fuels come into contact with the skin.

Many liquids used in this machine are harmful if taken internally or splashed into the eyes. In the event of accidentally swallowing oils, fuels, anti-freeze, battery acid etc, DO NOT encourage vomiting, seek qualified medical assistance immediately.

ALWAYS dispose of waste oils and fuels into waste oil storage tanks. If storage tanks are not available consult your distributor or local authority for addresses of local designated disposal points. It is illegal to dispose of waste oil into drains or water courses or to bury it.

## DUMPER SAFETY

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Equipment which includes friction materials will sometimes contain asbestos. When removing friction material dust from components, such as when servicing brakes or clutches, do not blow out with an airline; it could be harmful to inhale the dust. Remove the dust with a vacuum cleaner or wipe clean with a damp rag. Waste should be placed in a sealed container, marked, and disposed of in accordance with local or national regulations.

The accumulated dust found in clutch housings may contain lead/antimony. No food should be eaten at a work place contaminated by this dust. Hands must be washed before eating. Do not blow out dust with an airline.

*ALWAYS* ensure that the starting handle is clean and in good condition. Keep the engine starting dog, and the part of the starting handle that mates with it, lightly lubricated (*Refer to the Engine Handbook*).

*NEVER* work under an unpropped skip. *If the dumper was supplied with a special Skip Support always ensure that it is used.*

*Some articulating dumpers are manufactured with an articulation lock. If your machine has this feature, ALWAYS fit the articulation lock when servicing or working on the machine.*

## PREPARATION FOR USE

Before the Dumper is put into service, always check the following points:

### ENGINE

Check the oil level on the dipstick, topping up if necessary to the full mark.

### GEARBOX

Check the oil level on the dipstick, topping up if necessary to the full mark.

### DRIVE AXLES AND TRANSFER CASE

Remove filler/level plugs from drive axles and filler/level plug from transfer case and check that oil is up to bottom of holes. Top up if necessary, through filler/level plugs.

### FUEL TANK

Fill tank with diesel oil until approximately 1" from the top.

NOTE: Never allow fuel level to fall below 2" deep in the bottom of the tank.

### HYDRAULIC TANK

Fill the hydraulic tank. Before removing the cap, clean the surrounding area to prevent the possible entry of foreign matter.

### BRAKE SYSTEM

Ensure that the fittings are tight on both hoses supplying the brake master cylinder from the main hydraulic tank.

### MISCELLANEOUS

Check all wheel nuts for tightness.

Check all nuts and bolts for tightness, loose nuts and bolts may lead to damage not covered by Warranty.

NB. FOR FURTHER INFORMATION ABOUT LUBRICATION AND RECOMMENDED OILS SEE RECOMMENDED LUBRICANT CHART & GENERAL MAINTENANCE SECTION.

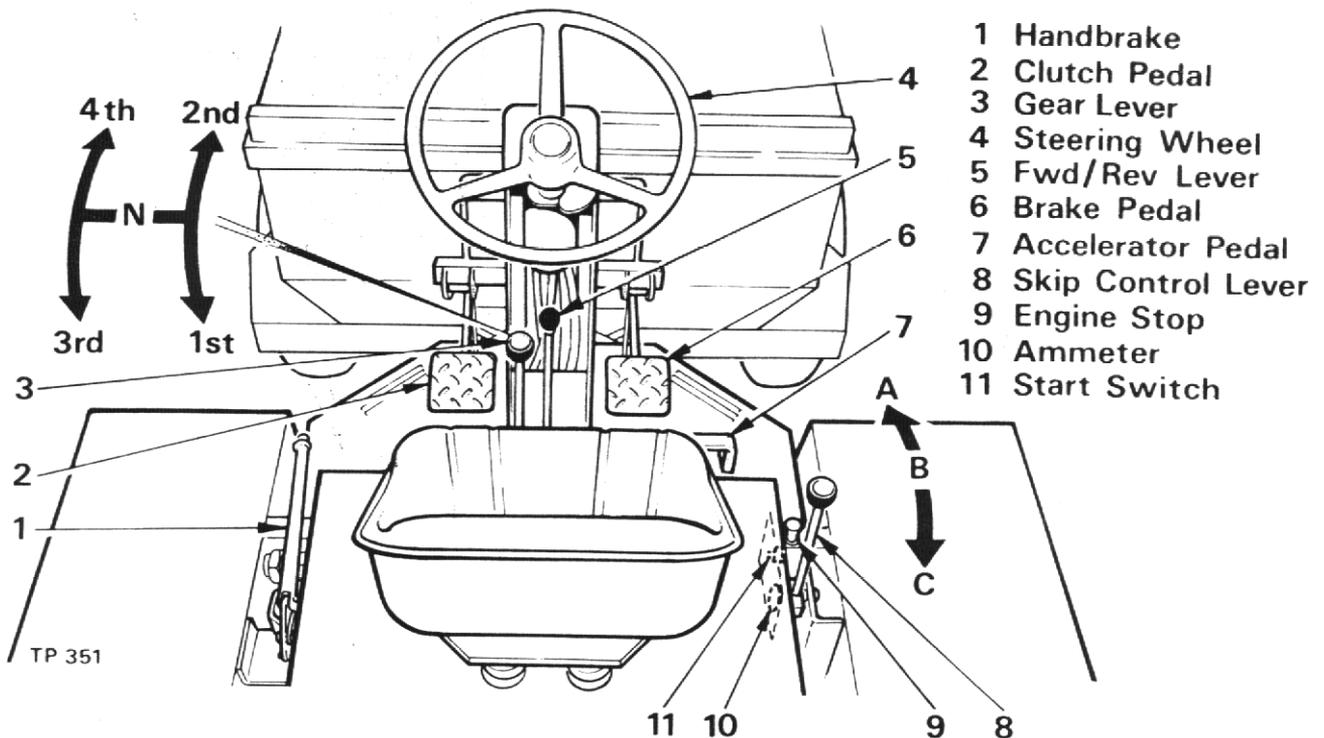


FIG. 1

## SPECIFICATION FOR MACHINES WITH FORWARD TIP

A	Overall Height	1995mm	(6' 6 1/2")
B	Skip Loading Height	1555mm	(5' 11 1/4")
C	Wheelbase	1790mm	(5' 10 1/2")
D	Overall Length	3793mm	(12' 5 1/4")
E	Ground Clearance	310mm	(1' 0 1/4")
F	Overall Width	1800mm	(5' 11")
G	Skip Ground Clearance When Tipped	440mm	(1' 5 1/2")
H	Overall Height Tipped	2215mm	(7' 3 1/4")
J	Discharge Forward of Tyre	514mm	(1' 8 1/4")
K	Overhang	958mm	(3' 13 1/4")
L	Wheeltrack	1525mm	(5' 0")
M	Prow Width	1350mm	(4' 5")

### SKIP

Water Level	1130 Litres	(40 cu.ft)
Struck Level	1140 Litres	(51 cu.ft)
Heaped Level	1780 Litres	(63 cu.ft)
Maximum Payload	2540 Kgs	(5600 lbs)

### TANK CAPACITIES

Hydraulic	45.5 Litres	(10 galls)
Diesel	45.5 Litres	(10 galls)

Turning Circle	7570mm	(24' 10")	Tyre Pressure	(2.75 bar)	40 p.s.i.
Unladen Weight	2080 Kgs	(4586 lbs)			
Hydraulic Relief Valve set at	(138 bar)	(2000 psi)			
Rear Axle Articulation	355mm	(1' 2")			

### ROAD SPEEDS

Newage 29TRA Transmission (40A50)

	<u>Fwd</u>		<u>Rev</u>	
	m.p.h.	k.p.h.	m.p.h.	k.p.h.
1 <sup>st</sup>	2.2	(3.5)	2.5	(4.0)
2 <sup>nd</sup>	3.6	(5.8)	4.0	(6.4)
3 <sup>rd</sup>	5.8	(9.3)	6.5	(10.5)
4 <sup>th</sup>	9.5	(15.3)	10.6	(17.0)

### OIL CAPACITIES

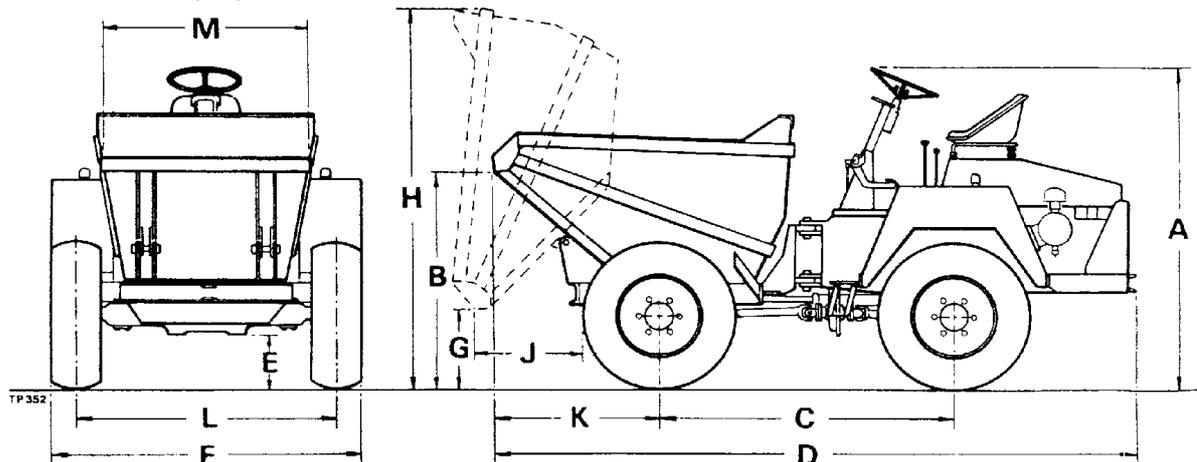
Transfer Box	.85 Litres (1.5pints)
Gearbox	1.85 Litres (3.5pints)
Drive Axle Hamworthy	6.82 Litres (12pints)
Drive Axle Newage	4.6 .Litres (8 pints)
Engine Petter PH2	6.8 Litres (12 pints)
Engine Lister ST3	7.5 Litres (13.2 pints)

Newage 70M/40M Transmission (4A50/4A50E)

	m.p.h.	k.p.h.
1 <sup>st</sup>	1.9	(3.1)
2 <sup>nd</sup>	4.5	(7.2)
3 <sup>rd</sup>	8.4	(13.5)
Rev	2.2	(3.5)

### ENGINE SPECIFICATIONS

Petter PH2 (4A50E)	Schedule 1079 Hand Start
Petter PH2 (4A50E)	Schedule 1083 Electric Start
Lister ST3 (40A50)	Schedule 1080 Electric Start



## SPECIFICATION FOR MACHINES WITH HIGH DISCHARGE SKIP

A	Overall Height	2040mm	(6' 8 1/4")
B	Skip Loading Height	1865mm	(6' 1 1/2")
C	Wheelbase	1790mm	(5' 10 1/2")
D	Overall Length	3757mm	(12' 4")
E	Ground Clearance	310mm	(1' 0 1/4")
F	Overall Width	1800mm	(5' 11")
G	Skip Ground Clearance When Tipped	1735mm	(5' 8 1/4")
H	Overall Height Tipped	3335mm	(10' 11 1/4")
J	Discharge Forward of Tyre	520mm	(1' 8 1/2")
K	Overhang	922mm	(3' 0 1/4")
L	Wheeltrack	1525mm	(5' 0")
M	Prow Width	667mm	(2' 2 1/4")

### SKIP

Water Level	963 Litres	(34 cu.ft)
Struck Level	Litres	
Heaped Level	Litres	
Maximum Payload	2040 Kgs	(4480 lbs)

### TANK CAPACITIES

Hydraulic	45.5 Litres	(10 galls)
Diesel	45.5 Litres	(10 galls)

Turning Circle	7570mm	(24' 10")	Tyre Pressure	(2.75 bar)	40 p.s.i.
Unladen Weight	2190 Kgs	(4828 lbs)			
Hydraulic Relief Valve set at	(138 bar)	(2000 psi)			
Rear Axle Articulation	355mm	(1' 2")			

### ROAD SPEEDS

Newage 29TRA Transmission (40A50)

	<u>Fwd</u>		<u>Rev</u>	
	m.p.h.	k.p.h.	m.p.h.	k.p.h.
1 <sup>st</sup>	2.2	(3.5)	2.5	(4.0)
2 <sup>nd</sup>	3.6	(5.8)	4.0	(6.4)
3 <sup>rd</sup>	5.8	(9.3)	6.5	(10.5)
4 <sup>th</sup>	9.5	(15.3)	10.6	(17.0)

### OIL CAPACITIES

Transfer Box	.85 Litres (1.5pints)
Gearbox	1.85 Litres (3.5pints)
Drive Axle Hamworthy	6.82 Litres (12pints)
Drive Axle Newage	4.6 Litres (8 pints)
Engine Petter PH2	6.8 Litres (12 pints)
Engine Lister ST3	7.5 Litres (13.2 pints)

Newage 70M/40M Transmission (4A50/4A50E)

	m.p.h.	k.p.h.
1 <sup>st</sup>	1.9	(3.1)
2 <sup>nd</sup>	4.5	(7.2)
3 <sup>rd</sup>	8.4	(13.5)
Rev	2.2	(3.5)

### ENGINE SPECIFICATIONS

Petter PH2 (4A50E)	Schedule 1079 Hand Start
Petter PH2 (4A50E)	Schedule 1083 Electric Start
Lister ST3 (40A50)	Schedule 1080 Electric Start

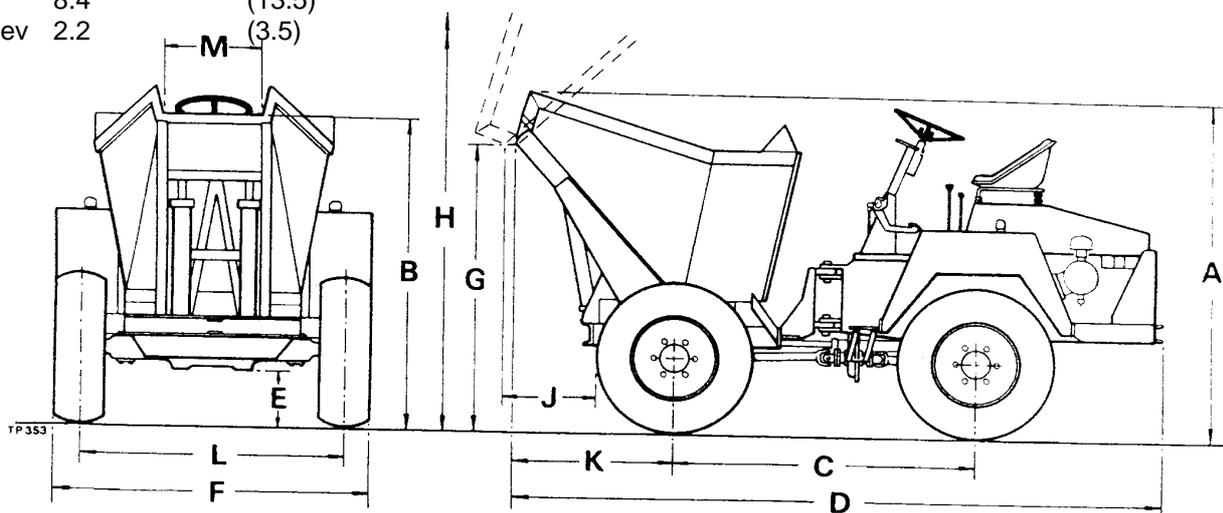


FIG. 3

## SPECIFICATION FOR MACHINES WITH ROTATING WIDE MOUTH SKIP

A	Overall Height	1995mm	(6' 6 1/2")
B	Skip Loading Height	1330mm	(4' 4 1/2")
C	Wheelbase	1790mm	(5' 10 1/2")
D	Overall Length	3950mm	(12' 11 1/2")
E	Ground Clearance	310mm	(1' 0 1/4")
F	Overall Width	1800mm	(5' 11")
G	Skip Ground Clearance When Tipped	615mm	(2' 0 1/4")
H	Overall Height Tipped	2595mm	(8' 6 1/4")
K	Overhang	1115mm	(3' 8 3/4")
L	Wheeltrack	1525mm	(5' 0")
M	Prow Width	1067mm	(3' 6")
N	Side Discharge Distance	260mm	(0' 10 1/4")

### SKIP

Water Level	850 Litres	(30 cu.ft)
Struck Level	960 Litres	(34 cu.ft)
Heaped Level	1220 Litres	(43 cu.ft)
Maximum Payload	2040 Kgs	(4480 lbs)

### TANK CAPACITIES

Hydraulic	45.5 Litres	(10 galls)
Diesel	45.5 Litres	(10 galls)

Turning Circle	7570mm	(24' 10")	Tyre Pressure	(2.75 bar)	40 p.s.i.
Unladen Weight	2091 Kgs	(4610 lbs)			
Hydraulic Relief Valve set at	(138 bar)	(2000 psi)			
Rear Axle Articulation	355mm	(1' 2")			

### ROAD SPEEDS

Newage 29TRA Transmission (40A50)

	Fwd		Rev	
	m.p.h.	k.p.h.	m.p.h.	k.p.h.
1 <sup>st</sup>	2.2	(3.5)	2.5	(4.0)
2 <sup>nd</sup>	3.6	(5.8)	4.0	(6.4)
3 <sup>rd</sup>	5.8	(9.3)	6.5	(10.5)
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Newage 70M/40M Transmission (4A50/4A50E)

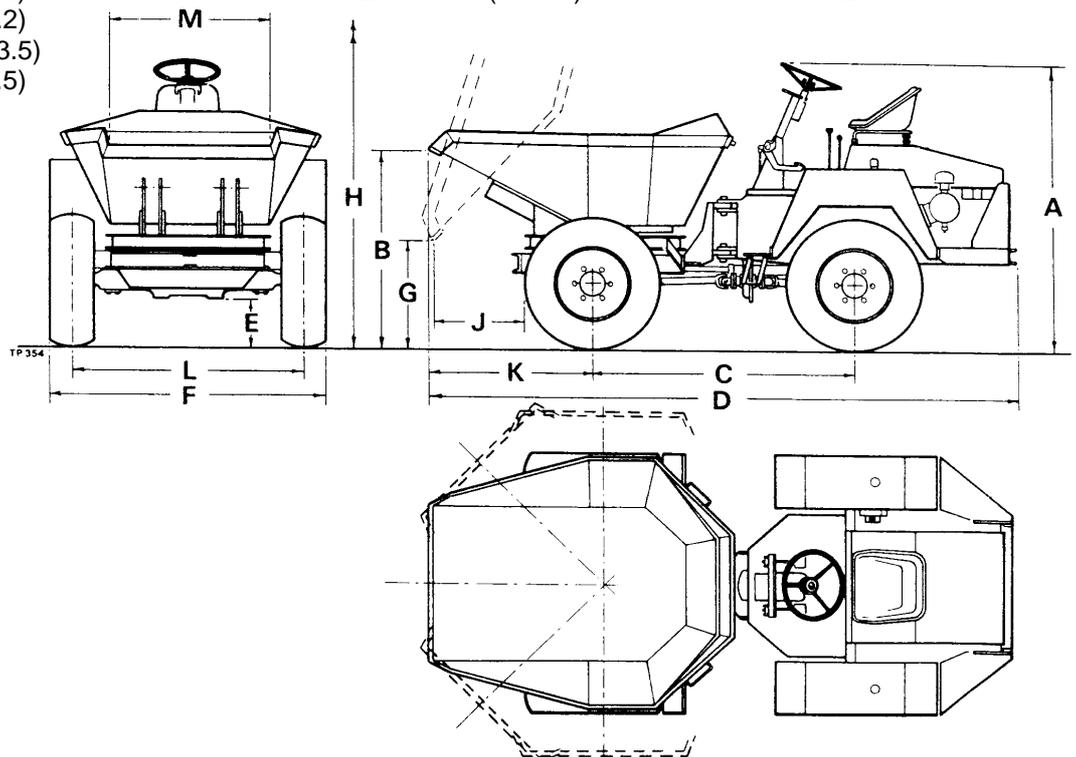
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3 <sup>rd</sup>	8.4	(13.5)
Rev	2.2	(3.5)

### OIL CAPACITIES

Transfer Box	.85 Litres (1.5pints)
Gearbox	1.85 Litres (3.5pints)
Drive Axle Hamworthy	6.82 Litres (12pints)
Drive Axle Newage	4.6 Litres (8 pints)
Engine Petter PH2	6.8 Litres (12 pints)
Engine Lister ST3	7.5 Litres (13.2 pints)

### ENGINE SPECIFICATIONS

Petter PH2 (4A50E)	Schedule 1079 Hand Start
Petter PH2 (4A50E)	Schedule 1083 Electric Start
Lister ST3 (40A50)	Schedule 1080 Electric Start



## SPECIFICATION FOR MACHINES WITH ROTATING NARROW MOUTH SKIP

A	Overall Height	20855mm	(6' 10")
B	Skip Loading Height	1305mm	(4' 3 1/4")
C	Wheelbase	1790mm	(5' 10 1/2")
D	Overall Length	3900mm	(12' 9 1/2")
E	Ground Clearance	310mm	(1' 0 1/4")
F	Overall Width	1800mm	(5' 11")
G	Skip Ground Clearance When Tipped	615mm	(2' 0 1/4")
H	Overall Height Tipped	2595mm	(8' 6 1/4")
K	Overhang	1065mm	(3' 6")
L	Wheeltrack	1525mm	(5' 0")
M	Prow Width	510mm	(1' 8")
N	Side Discharge Distance	260mm	(0' 10 1/4")

### SKIP

Water Level	850 Litres	(30 cu.ft)
Struck Level	960 Litres	(34 cu.ft)
Heaped Level	1220 Litres	(43 cu.ft)
Maximum Payload	2040 Kgs	(4480 lbs)

### TANK CAPACITIES

Hydraulic	45.5 Litres	(10 galls)
Diesel	45.5 Litres	(10 galls)

Turning Circle	7570mm	(24' 10")	Tyre Pressure	(2.75 bar)	40 p.s.i.
Unladen Weight	2091 Kgs	(4610 lbs)			
Hydraulic Relief Valve set at	(138 bar)	(2000 psi)			
Rear Axle Articulation	355mm	(1' 2")			

### ROAD SPEEDS

Newage 29TRA Transmission (40A50)

	Fwd		Rev	
	m.p.h.	k.p.h.	m.p.h.	k.p.h.
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Newage 70M/40M Transmission (4A50/4A50E)

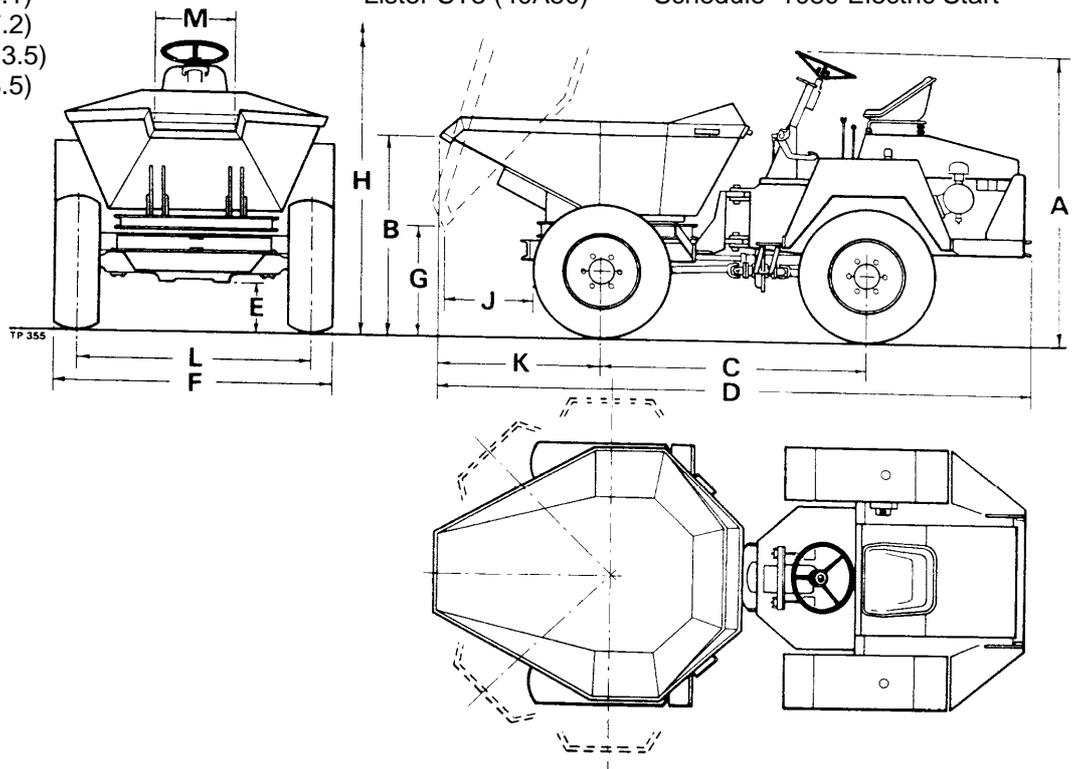
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1 <sup>st</sup>	1.9	(3.1)
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3 <sup>rd</sup>	8.4	(13.5)
Rev	2.2	(3.5)

### OIL CAPACITIES

Transfer Box	.85 Litres (1.5pints)
Gearbox	1.85 Litres (3.5pints)
Drive Axle Hamworthy	6.82 Litres (12pints)
Drive Axle Newage	4.6 .Litres (8 pints)
Engine Petter PH2	6.8 Litres (12 pints)
Engine Lister ST3	7.5 Litres (13.2 pints)

### ENGINE SPECIFICATIONS

Petter PH2 (4A50E)	Schedule 1079 Hand Start
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Lister ST3 (40A50)	Schedule 1080 Electric Start



## RECOMMENDED LUBRICATING OILS

COMPANY	ENGINE	NEWAGE DRIVE AXLE	HAMWORTHY DRIVE AXLE	TRANSFER BOX	GEARBOX	WHEEL BEARINGS & OTHER GREASE POINTS	HYDRAULIC SYSTEM
(U.K.) ESSO (Overseas)	SUMMER WINTER ABOVE 32°C 0°C - 32°C BELOW 0°C	TORQUE FLUID 62	IL 2082  IL 2082 IL 2082	GEAR OIL GP 85W/140  GEAR OIL GP 85W/140 GEAR OIL GP 85W/140 GEAR OIL GP 80W	ESSOLUBE HDX 30  ESSOLUBE HDX 30	BEACON 2  BEACON 2	NUTO H32  NUTO H68 NUTO H32 NUTO H22
(U.K.) CASTROL (Overseas)	SUMMER WINTER ABOVE 32°C 0°C - 32°C BELOW 0°C	AGRICASTROL AS  AGRICASTROL AS SPECIAL	AGRICASTROL AS  AGRICASTROL AS AGRICASTROL MD	DEUSOL EP 90  DEUSOL GEAR EP 140 DEUSOL GEAR EP 90 DEUSOL GEAR EP 80	DEUSOL CRI 30  DEUSOL CRI 30	CASTROL SPHEEROL APT 2  CASTROL SPHEEROL APT 2	CASTROL HYPSPIN AWS 32
(U.K.) SHELL (Overseas)	SUMMER WINTER ABOVE 32°C 0°C - 32°C BELOW 0°C		DONAX T12 (INITIAL FILL) SPIRAX EP 80 (Top up only)  DONAX T12 (INITIAL FILL) SPIRAX EP 80 (Top up only) S.7224 (INITIAL FILL) SPIRAX HD 75 (Top up only)	SPIRAX 90 EP  SPIRAX 140 EP SPIRAX 90 EP SPIRAX 80 EP	ROTELLA SX OIL 30  ROTELLA SX OIL 30	RETINAX A  RETINAX A	TELLUS OIL 37
(U.K.) BP (Overseas)	SUMMER WINTER ABOVE 32°C 0°C - 32°C BELOW 0°C		B.P. HYDRAULIC TF-8  B.P. HYDRAULIC TF-8 B.P. TRACTRAN (Top up only)	GEAR OIL SAE 90 EP  GEAR OIL SAE 140 EP GEAR OIL SAE 90 EP GEAR OIL SAE 80 EP	VANELLUS M30  VANELLUS M30	ENERGREASE L2  ENERGREASE L2	ENERGOL HLP 65
(U.K.) MOBIL (Overseas)	SUMMER WINTER ABOVE 32°C 0°C - 32°C BELOW 0°C		MOBIL FLUID 422  MOBIL FLUID 422  MOBIL FLUID 427	MOBILUBE HD 90 MOBILUBE GX 90 MOBILUBE HD 140 MOBILUBE GX 140 MOBILUBE HD 90 MOBILUBE GX 90 MOBILUBE HD 80 MOBILUBE GX 80	DELVAC 1230  DELVAC 1230  DELVAC 1230	MOBILGREASE MP  MOBILGREASE SUPER	DTE 24
(U.K.) WALKERS CENTURY (Overseas)	SUMMER WINTER ABOVE 32°C 0°C - 32°C BELOW 0°C		CENTLUBE F.76 COMPOUND  CENTLUBE F.76 COMPOUND CENTLUBE E.76 COMPOUND	CENTURY EP 90  CENTURY EP 140 CENTURY EP 90 CENTURY EP 80	CENTURY ROIL 30  CENTURY ROIL 30	REGULUS A2  REGULUS A2	CENTURY PWL A HYD. OIL  CENTURY PWL A HYD. OIL

IN THE UNLIKELY EVENT OF THE ABOVE OILS NOT BEING AVAILABLE  
EQUIVALENT OILS SUPPLIED BY A REPUTABLE MANUFACTURER MAY BE USED

## OPERATING INSTRUCTIONS

### ELECTRIC STARTING MACHINES

#### STARTING

1. Check that the Engine Stop Control knob is fully down.
2. Insert the ignition key in the isolating switch and turn clockwise.
3. Turn key further clockwise against spring load. DO NOT operate starter motor for more than 20 seconds at a time.
4. When engine is cold, "overload" may be required to facilitate starting and is set and returned to normal position as described in "Manual Starting" - see below.

#### STOPPING

Pull out stop control knob and hold fully out until engine stops. Release stop control knob when engine has ceased to turn. Turn key switch to OFF position.

### MANUAL STARTING MACHINES

#### STARTING

##### (LISTER)

1. Pull out overload lever (situated on R.H. side of engine, above speed control arm) and lift to its highest position.

##### (PETTER)

1. Lift red-painted overload stop situated on the fuel pump rack above and to the rear of the priming levers and move fuel pump rack into fully open position. Operate priming levers six times. NOTE: This is unnecessary if engine is already warm.
2. Lift decompression lever(s) (positioned on top of engine) and turn engine as fast as possible using starting handle. When engine is turning at a good speed, knock down decompression levers and engine should fire.
3. If engine does not fire, lift decompression levers and slowly crank engine a few times before attempting to start again. Where ambient temperature is  $-15^{\circ}\text{C}$  ( $5^{\circ}\text{F}$ ) or below, a cold starting aid should be fitted.
4. Set overload lever horizontal when engine starts. (LISTER)

#### STOPPING

Pull out stop control knob and hold fully out until engine stops. Release stop control knob when engine has ceased to turn.

#### IMPORTANT

1. DO NOT stop engine by means of decompression levers, this will lead to damaged valve seats and cylinder head joints.
2. DO NOT stop engine by closing fuel tap or by allowing fuel tank to run dry, this will allow air into fuel lines and necessitate bleeding and priming system.

#### GEAR CHANGING - (FOUR A 50 & FOUR A 60)

The Dumper is fitted with a four speed gearbox with a Forward and Reverse Selector. Ensure the machine is brought to a standstill before changing direction of drive.

#### GEAR CHANGING - (FOUR A 30, FOUR A 30E, FOUR A 40, FOUR A 40E, FOUR A 50E & FOUR A 80)

The Dumper is fitted with three Forward and one Reverse gear. When changing gear, the clutch pedal is used in the normal way.

#### SKIP CONTROL LEVER (See Fig.1)

1. Control lever has three positions DUMP (A), HOLD (B) and RETURN (C).
2. Push lever forward to DUMP (A) to deposit load.
3. Pull lever back to RETURN (C) to return skip to carrying position.

NOTE: If lever is released when in the DUMP or RETURN position, it will automatically return to HOLD (B) position and motion of skip will cease. In this way, speed at which load is deposited can be finely controlled.

#### ROTATING SKIP (IF FITTED)

Pull cranked release lever on turntable catch fully back to release turntable. Revolve skip to required position. To lock in position lift release lock lever and ensure that locking lug locates in turntable locking plate. Cranked release lever will return to its former position.

## GENERAL MAINTENANCE

### PERIODIC MAINTENANCE

1. DAILY check engine oil level and fill to full mark on dipstick, if necessary.
2. DAILY fill fuel tank, or as often as proves necessary to approximately 1" of top. Never allow there to be a depth of less than 2" of fuel in tank.
3. DAILY check tyre pressures and condition of tyres (refer to specification page).
4. WEEKLY check oil level in gearbox and fill to full mark on dipstick if necessary.
5. WEEKLY remove filler/level plugs from drive axles and transfer case. Oil level should be to bottom of holes. Top up, if necessary through filler/level plugs.
6. WEEKLY check oil level in hydraulic tank. Always clean the surrounding area before removing cap to prevent possible entry of foreign matter. Fill tank, if necessary, to within 1" of top.
7. WEEKLY check that fittings are tight on feed pipe from hydraulic tank to master cylinder. Check for leaks.
8. WEEKLY apply grease to all grease nipples.
9. WEEKLY check all wheel nuts and tighten if necessary.
10. WEEKLY check all nuts and bolts and tighten if necessary.
11. EVERY SIX MONTHS repack steering column with water repellent grease.

**IMPORTANT: CHANGE HYDRAULIC OIL FILTER ELEMENT AFTER FIRST 100 HOURS AND THEREAFTER EVERY 300 HOURS.**

Lubrication  
(See Fig.6)

Period	Key	Description	Lubrication	No. of Points
	1	Engine	Engine Oil	1
	2	Fuel Tank	Diesel Fuel	1
	3	Gearbox	Gearbox Oil	1
	4	Drive Axles	Axle Oil	2
	5	Hydraulic Tank	Hydraulic Oil	1
	6	Footbrake Pedal	Grease Gun	1
	7	Accelerator Pedal	Grease Gun	1
	8	Clutch Pedal	Grease Gun	1
	9	Clutch Cross Shaft	Grease Gun	2
	10	Skip Pivot	Grease Gun	2
	11	Handbrake Cable	Grease Gun	1
	12	Chassis Centre Pivot	Grease Gun	2
	13	Prop Shafts & Universal Joints	Grease Gun	10
	14	Transfer Case	Axle Oil	1
	15	Steering Column	Water Repellent Grease	1

- NOTES: 1. Rear Axle articulation points consist of bearings that require no lubrication.
2. For full details of the lubrication and maintenance of the engine, refer to Manufacturers Manual.

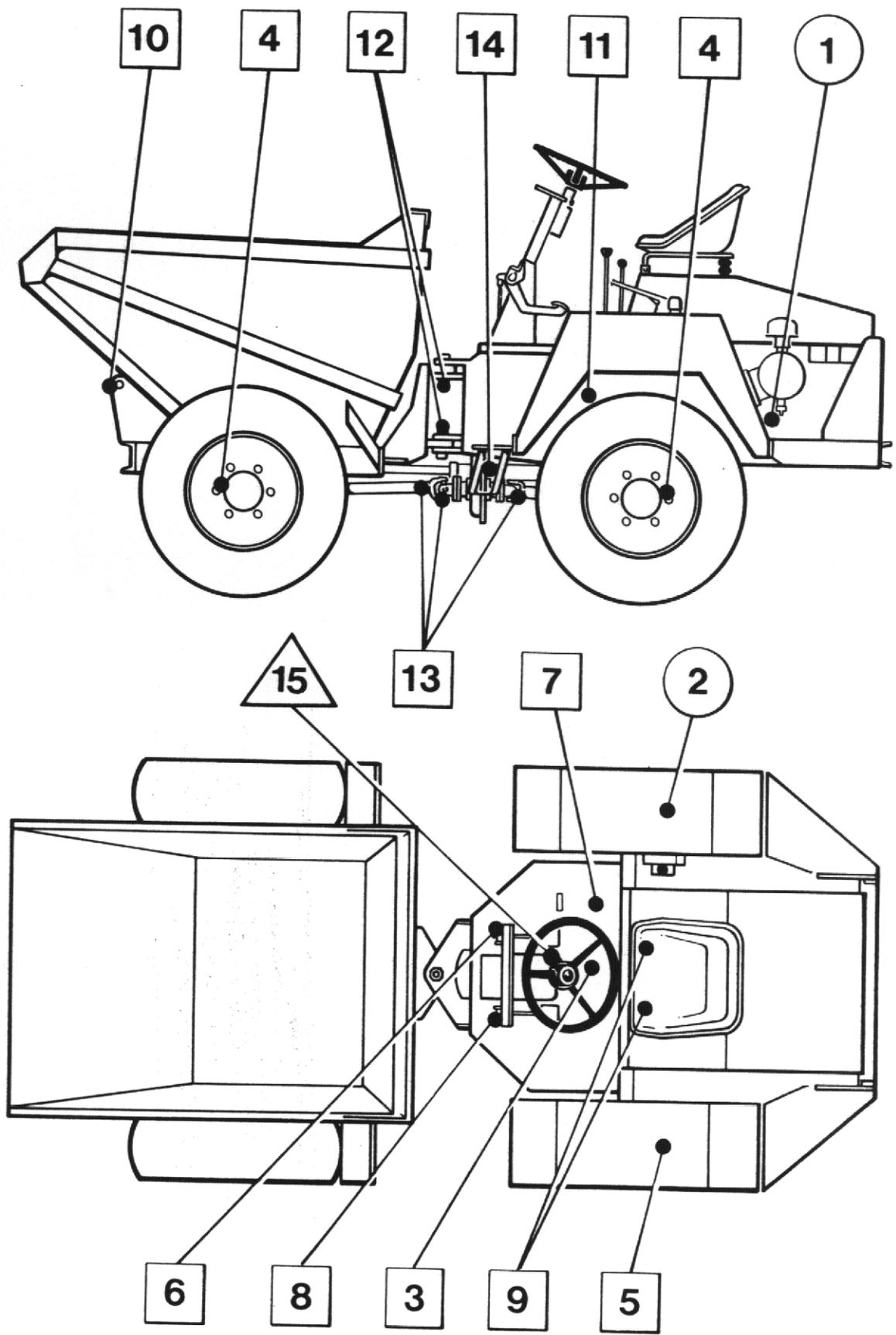


FIG. 6

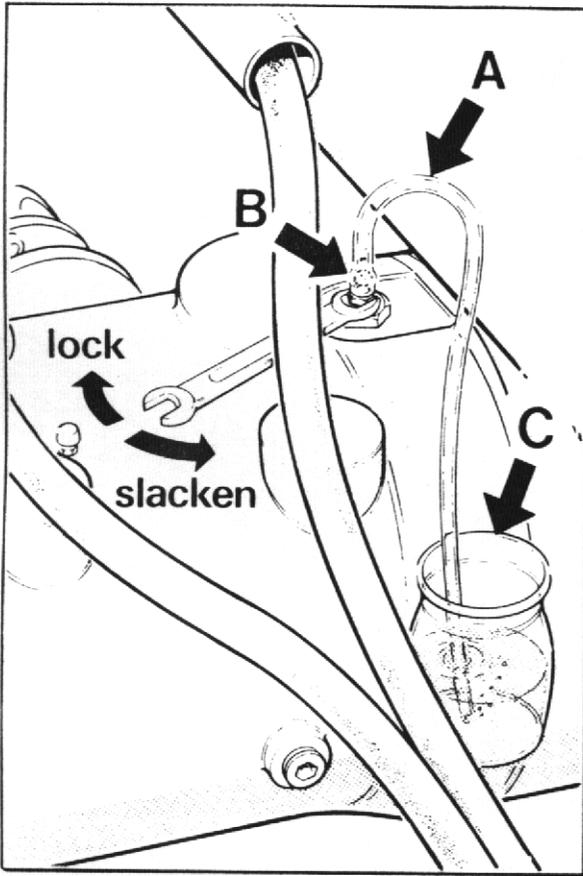


FIG. 7

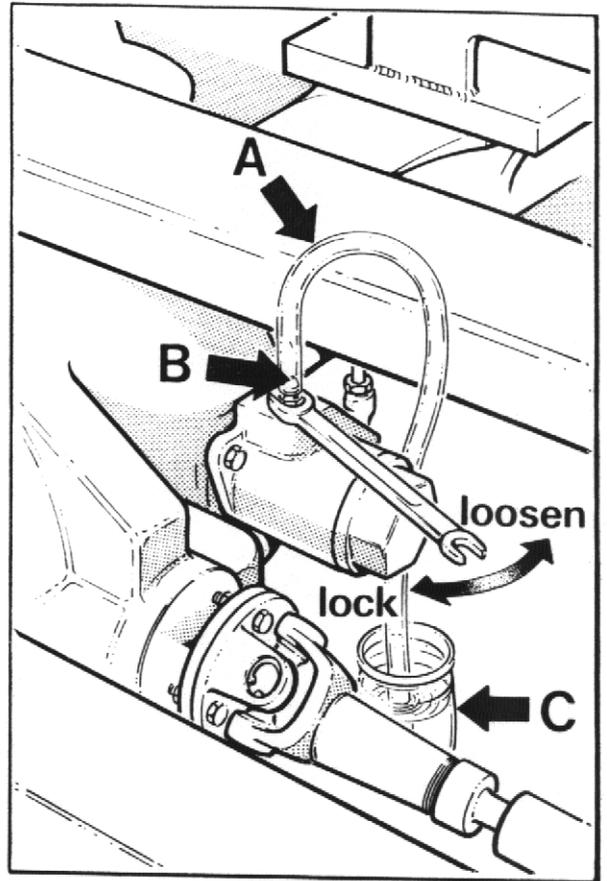


FIG. 8

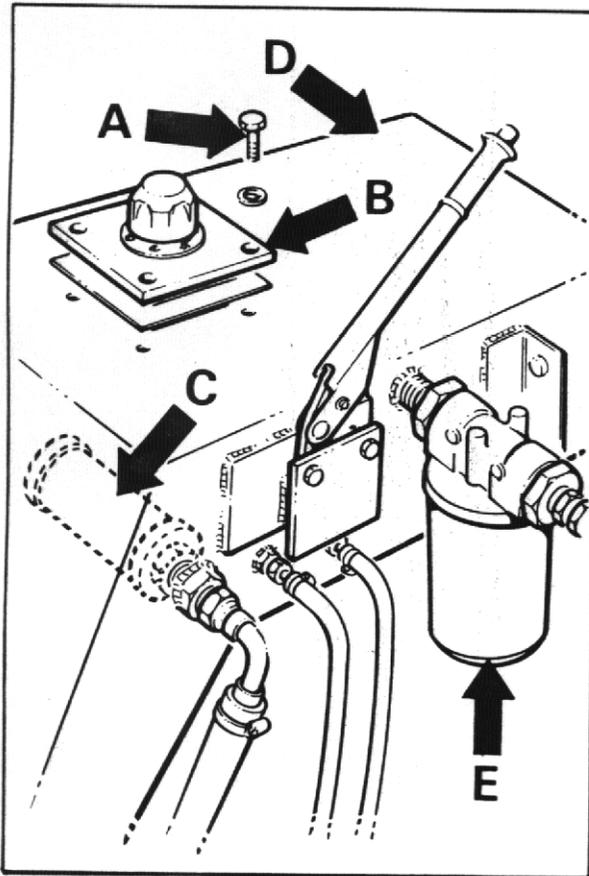


FIG. 9

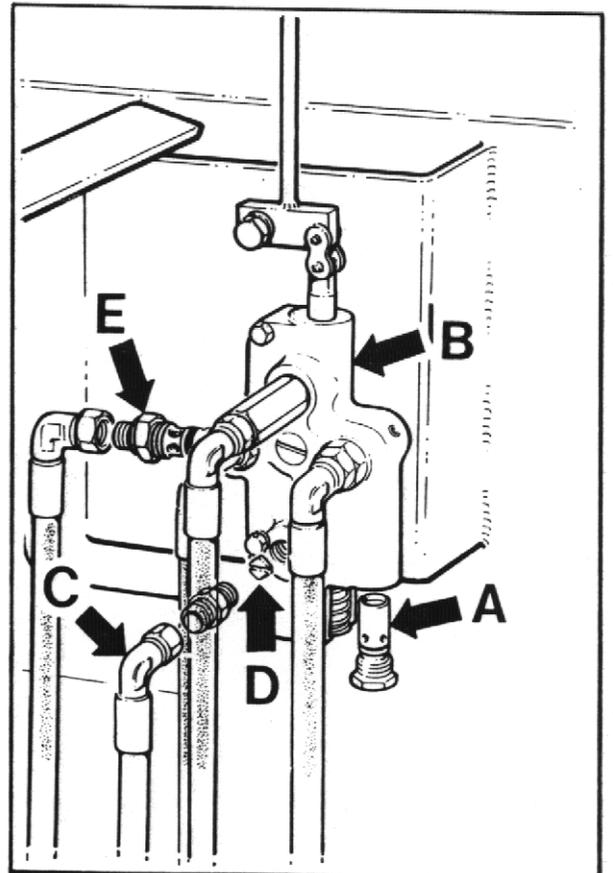


FIG. 10

## BRAKE SYSTEM

The brake system is designed to require the minimum of maintenance and no defects should normally occur. If air is present in the system, it will be indicated by sluggish response of the brakes and by spongy action of the brake pedal. This may be due to air being introduced at a loose joint. Any defects must be remedied immediately and the complete system bled.

To bleed the system, proceed as follows:-

1. Check that all connections are tight and all bleed screws are closed.
2. Check that there is sufficient oil in main hydraulic tank.
3. Attach bleeder tube (A) (See figs. 7 & 8) to the bleed screw (B) on front axle and immerse other end in a small quantity of hydraulic oil contained in a glass jar (C). Slacken bleed screw and operate brake pedal up and down to its full stroke, until oil pumped into the jar contains no air bubbles. Hold down pedal and close bleed screw. Remove bleeder tube and release pedal.
4. Carry out the procedure on the bleedscrew on the rear axle and continue until all air has been bled from the system.
5. Lock all the bleed screws.
6. Apply normal working load on brake pedal for two or three minutes and examine the entire system for leaks.

NOTE:- ALWAYS ENSURE THAT FREE PLAY EXISTS BETWEEN BRAKE PEDAL AND MASTER CYLINDERS. UNLESS THE PISTONS IN BOTH MASTER CYLINDERS ARE ALLOWED TO FULLY RETURN, BRAKE PRESSURE WILL BUILD UP AND THE BRAKES WILL REMAIN ON. 

## HYDRAULIC SYSTEM

The single hydraulic pump provides power for both the skip operation and steering. The main hydraulic valve splits the pump output into two circuits with controlled rate priority flow to steering circuit. If the hydraulic system fails to operate completely or does so extremely slowly carry out the following procedure.

1. Check that hydraulic tank is full of oil.
2. Check that hydraulic suction filter is not blocked. (See fig.9).
  - a) Remove the four setscrews (A) that secure the filler cap assembly (B) and remove assembly.
  - b) Unscrew suction filter (C) from inside tank (D) and wash in white spirit. Dry with moisture-free compressed air.
  - c) Replace suction filter and filler cap assembly.

NOTE: - If suction filter cannot be thoroughly cleaned, fit a new one.

Check that the return line filter element has been regularly changed in accordance with the maintenance schedule. If not, change filter element (E).

3. Check that the hydraulic pressures are correct.

Tip circuit.

  - a) Fit a 3000 lb/sq.in. gauge into the hydraulic system at the base of the skip ram.
  - b) Operate control lever to dump skip and check that pressure reading on gauge is 2000 lb/sq.in. when ram is fully extended and relief valve is "blowing".

## STEERING CIRCUIT

- a) Fit a 3000 lb/sq.in. gauge into the hydraulic system at the base of the steering ram.
- b) Turn steering wheel with machine on "full lock" and check that the reading on the gauge is 2000 lb/sq.in.

NOTE: - If correct pressure is not attained-

Tip circuit.

4. Remove relief valve cartridge (A) (hexagon head) from the bottom of the control valve (B) (See fig.10) and replace with a new one.
5. Remove hose adaptor (C) from control valve (See fig.10), remove hexagonal orifice plate (D) and wash in white spirit. Dry using moisture-free compressed air. DO NOT poke wire etc. into the orifice. Re-fit plate and hose adaptor with slot of orifice plate facing outwards.

STEERING CIRCUIT

6. Remove relief valve cartridge (A) (hexagon head) from the bottom of the control valve (B) (See fig.10) and replace with a new one.
7. Replace flow control valve (E) (See fig.10). (FOUR A50/60/80 only)

If none of these procedures correct the fault contact your Winget agent. Periodically check the hose between the pump and the tank to ensure it is not deformed. Any deformation in the hose may result in a restricted flow of fluid and damage to the pump.

RECOMMENDED TORQUE FIGURES FOR FASTENERS

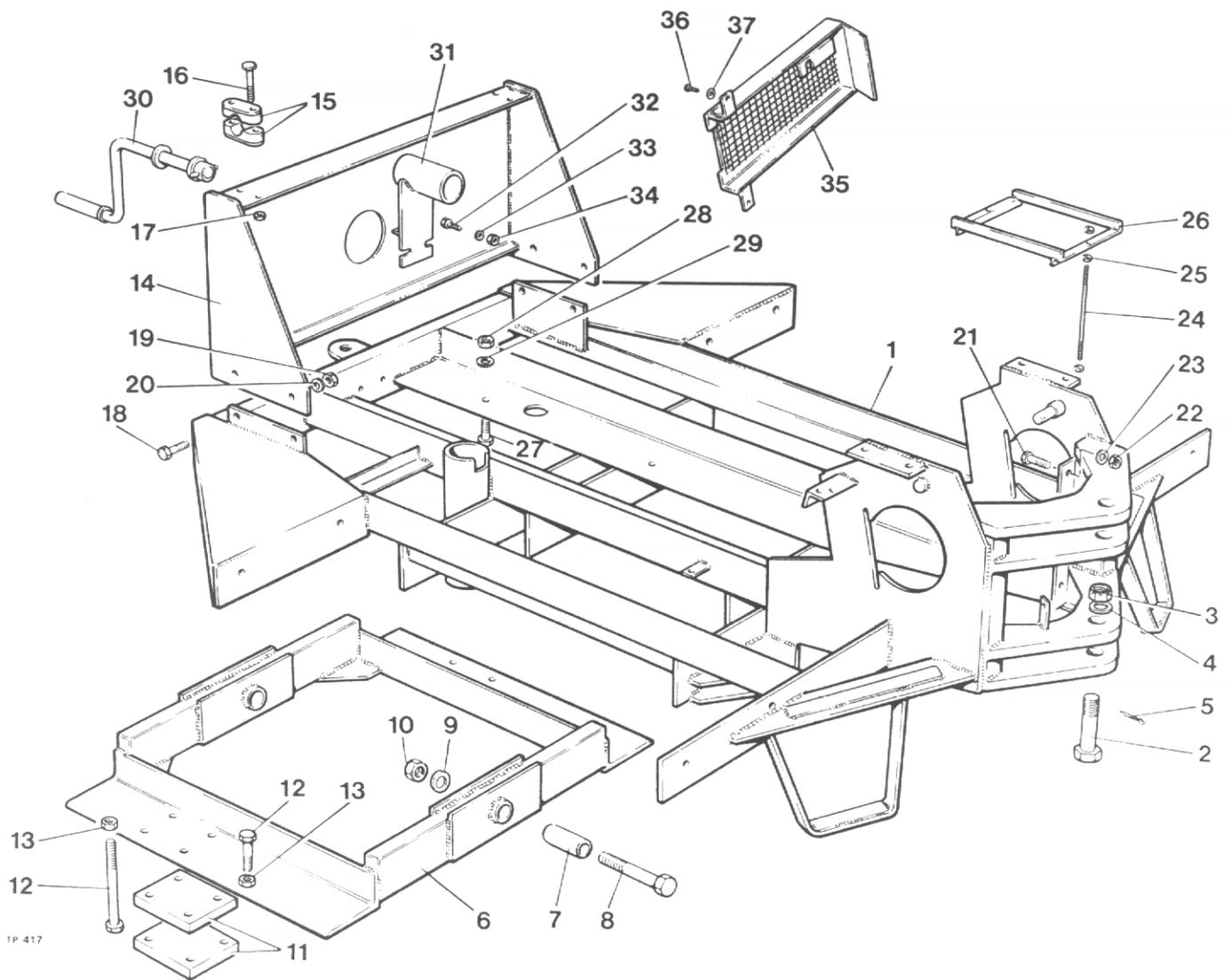
DESCRIPTION	TIGHTENING TORQUE	
	lb/ft.	Kg/m
Prop-Shaft Bolts 3/8" UNF .....	29	( 4.32 )
Prop-Shaft Bolts 7/16" UNF .....	46	( 6.85 )
Engine Bolts/Nuts M12 .....	72	( 10.7 )
Wheel Nuts 5/8" BSF .....	180	( 25 )
Wheel Nuts 7/8" BSF .....	300	( 42 )
Wheel Nuts M18 .....	200	( 28 )
Axle Bolts/Nuts M16 .....	180	( 26.8 )
Steer Ram Nuts/Bolts 1½" UNF/BSF .....	1080	(161.0 )
Centre Pivot Nuts/Bolts 1½" UNF .....	1880	(279.7 )

# SPARE PARTS SECTION

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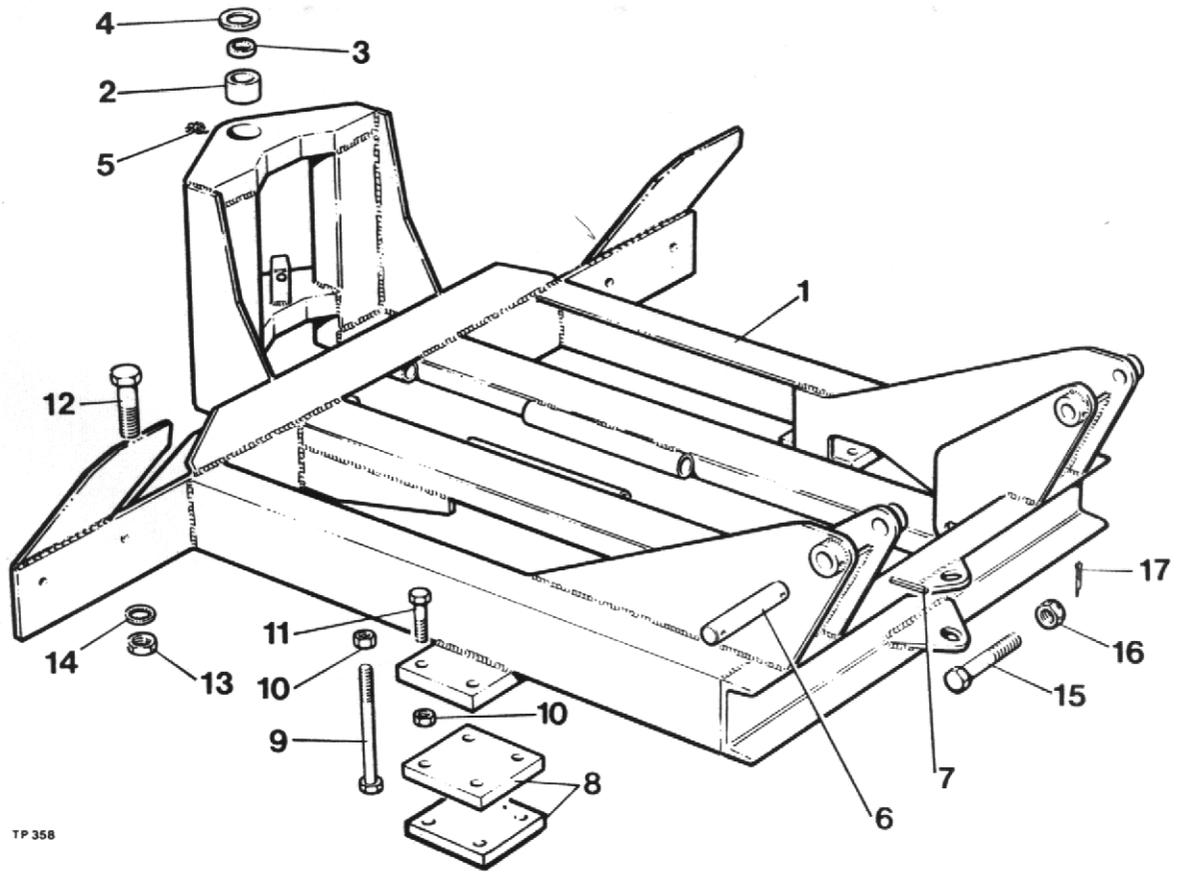


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## REAR CHASSIS & ARTICULATING FRAME

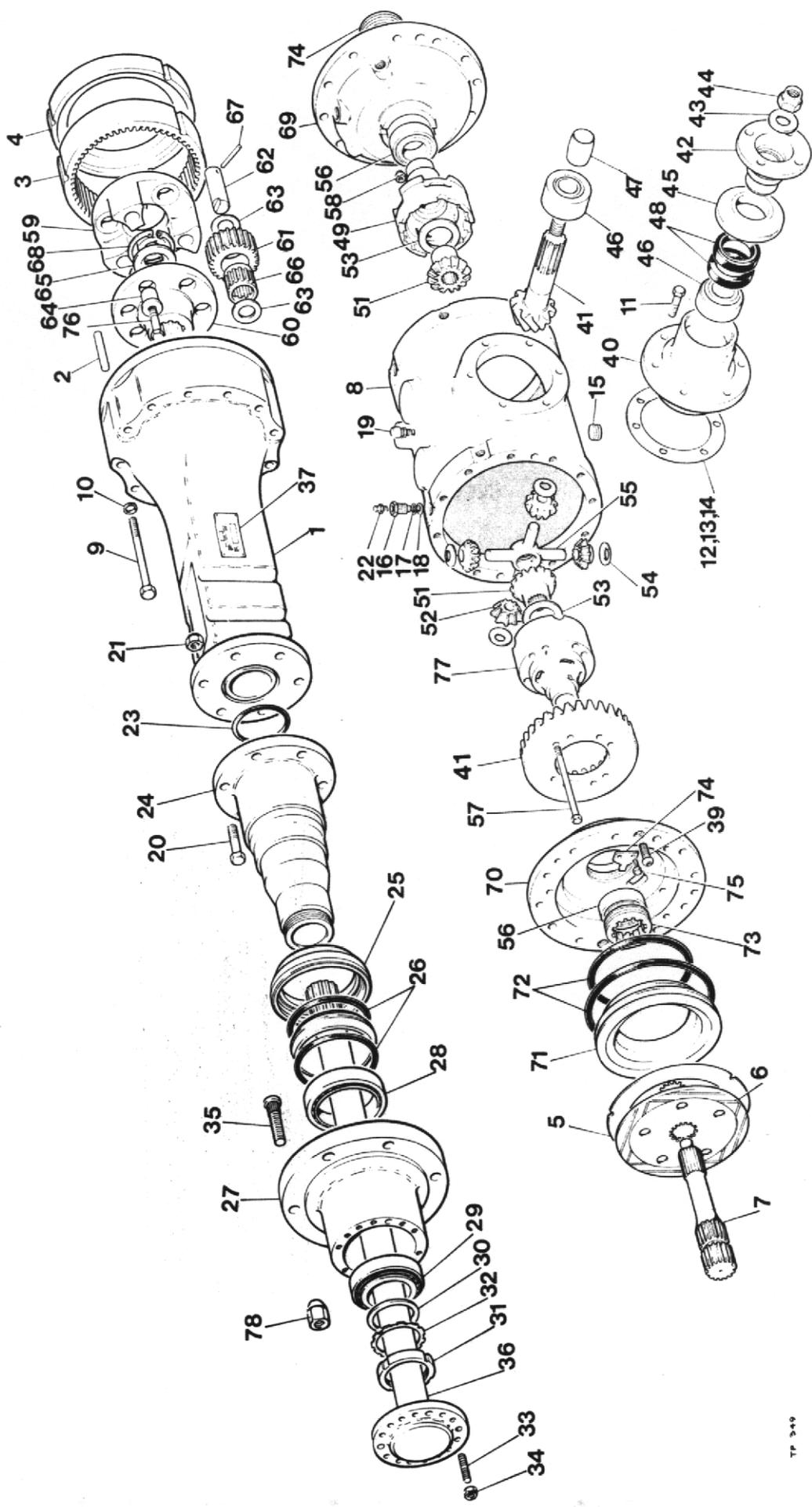
Item No.	Part No.	Description	Qty.
1	40076.A02	Rear Chassis .....	1
2	10375.A01	Bolt Hex. Hd. 1½" UNF x 110mm Long .....	2
3	4-60-171	Nut Castle 1½" UNF .....	2
4	4-60-240	Washer .....	2
5	44S.5L	Split Pin 3/16" dia. x 3" Long .....	2
6	30127.A01	Articulating Frame .....	1
7	10588.A01	Pivot Bush .....	2
8	8S.8S	Bolt M.24 x 130mm Long .....	2
9	12S.10	Washer Plain M.24 .....	2
10	61S.8	Locknut M.24 .....	2
11	CSE.193	Axle Clamp Plate (Newage Axle) .....	4
12	8S.6W	Bolt Hex Hd. M16 x 200 Long (Newage Axle) .....	8
	8S.6K	Bolt Hex Hd. M16 x 70 Long (Hamworthy Axle) .....	8
13	61S.6	Locknut M16 .....	8
14	40105.A02	Rear Frame .....	1
15	10364.A01	Pivot Block .....	2
16	8S.2F	Bolt Hex Hd. M6 x 50 Long .....	4
17	61S.2	Self Locking Nut M6 .....	4
18	11S.4C	Setscrew Hex Hd. M10 x 25 Long .....	4
19	61S.4	Nut M10 .....	4
20	12S.16	Washer Plain M10 dia. ....	4
21	8S.5D	Bolt Hex Hd. M12 x 40 Long .....	4
22	61S.5	Nut M12 .....	4
23	12S.6	Washer Plain M12 dia. ....	4
24	ESE.179-4	Battery Tie Rod (Electric Start M/c's).....	2
25	7S.2	Nut M6 (Electric Start M/C's) .....	8
26	10559.A01	Battery Clamp ..... (Electric Start M/C's) ...	1
27	6S.5K	Bolt Hex Hd. ½" UNF x 3" Long .....	4
28	132S.5	Locknut ½" UNF .....	4
29	10S.4	Washer Plain ½" Dia. ....	4
30	20155.A01	Starting Handle (Non Electric Start M/C's).....	1
	20155.A02	Starting Handle (Alt.)-(Non Elect. Start M/C's)..	1
31	20154.A01	Support Bkt. Start Hndle. (Non Elec. Start M/C's)	1
32	8S.4C	Bolt Hex Hd. M10 x 35 Lg. ( " " " " )	2
33	12S.5	Washer Plain M10 dia. ( " " " " )	2
34	61S.4	Nut Selflocking M10 ( " " " " )	2
35	30185.A02	Dynamo Belt Guard (Electric m/c's only).....	1
36	82S.3C	Screw Rd.Hd. 2BA x ½" Lg. (Elec. m/c's only) ....	2
37	12S.13	Washer - Flat 5mm (Elec. m/c's only) .....	2

# FRONT CHASSIS



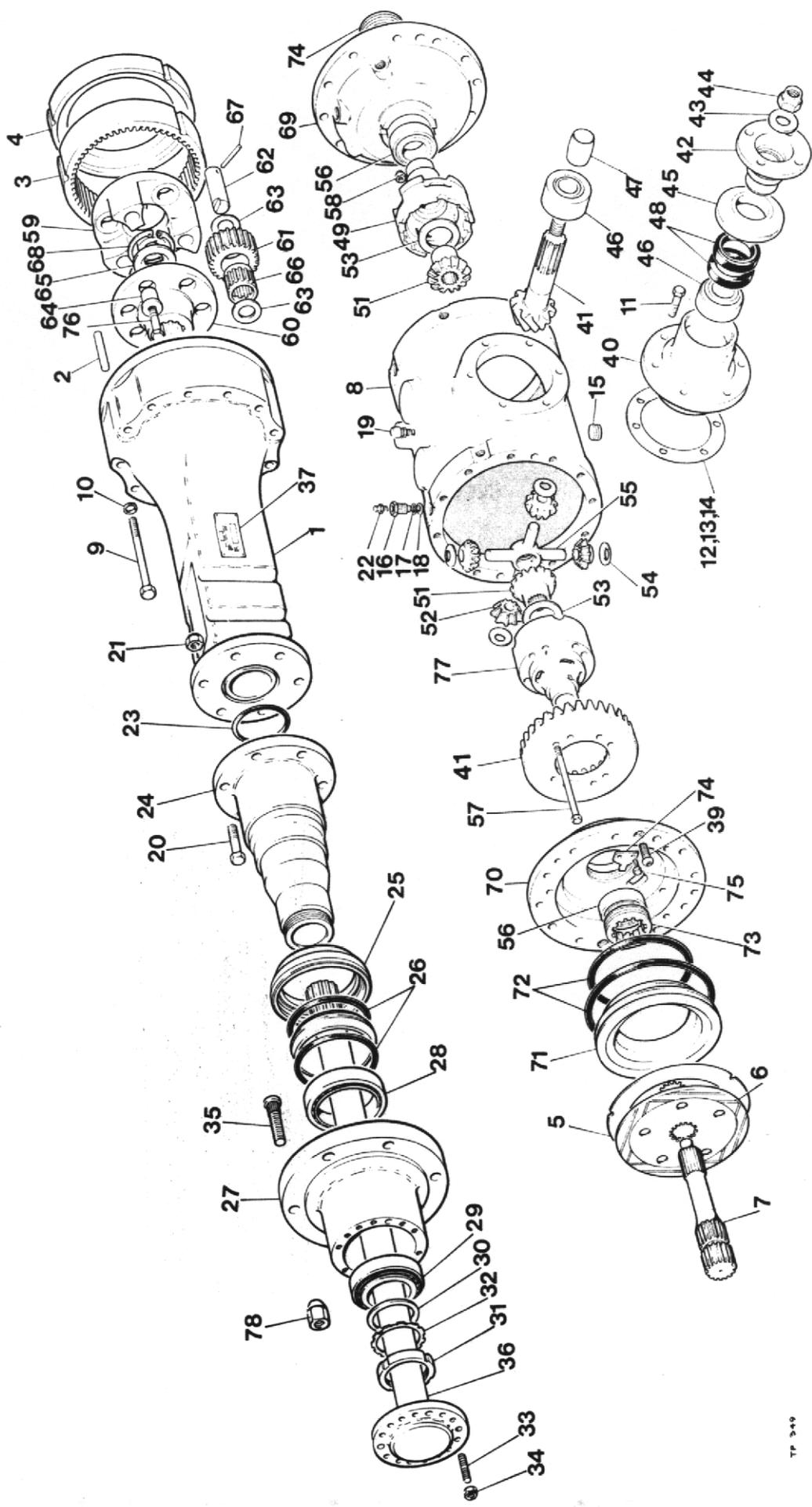
TP 358

Item No.	Part No.	Description	Qty.
1	40081.A02	Front Chassis Assembly .....	1
2	4-60-214	Pivot Bearing .....	2
3	ESE 199	Pivot Spacer .....	4
4	4-60-240	Washer .....	2
5	T90	Grease Nipple .....	2
6	10522.A01	Skip Pivot .....	2
7	54S.8S	Tension Pin .....	4
8	CSE 193	Axle Clamp Plate (Newage only) .....	4
9	8S.6Y	Bolt M16 x 2 0 Long (Newage only).....	8
10	61S.6	Locknut M16 Binx .....	8
11	8S.6M	Bolt M16 x 80 Long (Hamworthy) .....	8
12	10599.A01	Steering Ram Bolt 1½" UNF x 4, 3/8" Long ...	2
13	10600.A01	Steering Ram Nut 1½" UNF .....	2
14	67S.13	Shakeproof Washer 1½" .....	2
15	10352.A01	Ram Pivot Bolt 1½" UNF x 160 Long .....	2
16	10600.A01	Ram Pivot Nut 1½" UNF .....	2
17	44S.5H	Split Pin .....	2



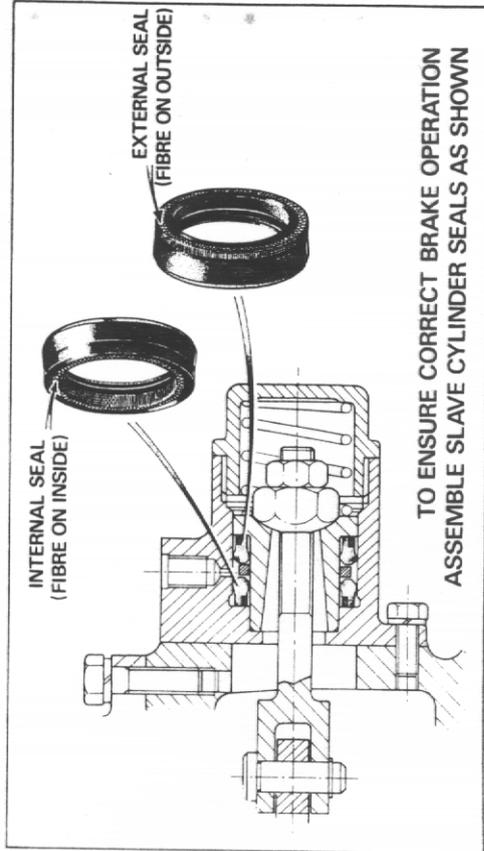
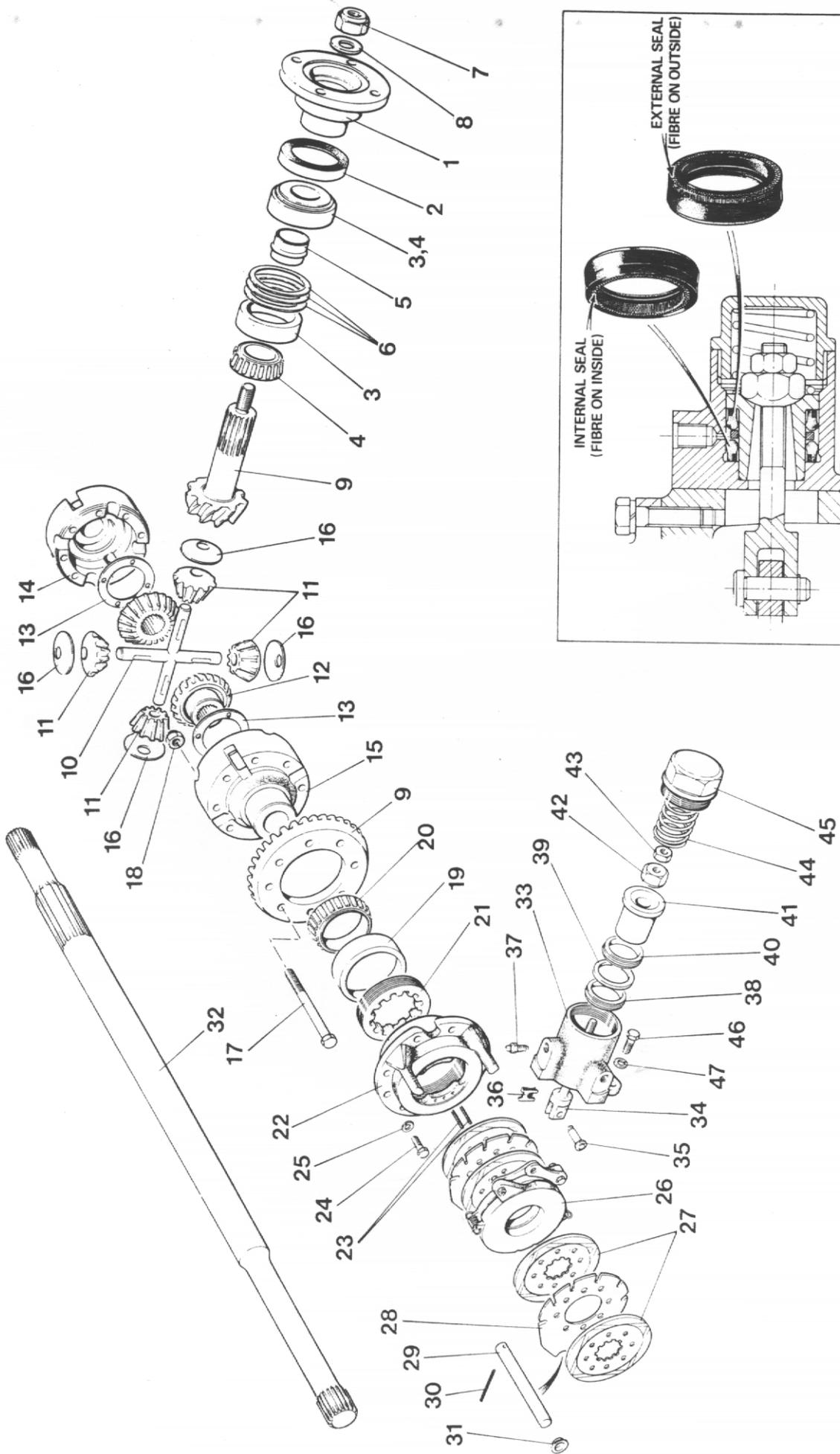
**DRIVE AXLE  
(NEWAGE 351)**

Item No.	Part No.	Description	Qty. Per Axle
	30082.A02	Axle complete .....	
1	30082.A0201	Axle Arm .....	2
2	30082.A0202	Pin .....	6
3	30082.A0203	Annulus .....	2
4	30082.A0204	Brake Spacer Plate .....	2
5	30082.A0205	Brake Fixed Plate .....	2
6	30082.A0206	Oil Immersed Brake Disc .....	2
7	30082.A0207	Sun Gear .....	2
8	30082.A0208	Main Axle Casing .....	1
9	4S.4Q	Bolt .....	24
10	17S.4	Spring Washer .....	24
11	11S.4	Hex.Hd. Screw .....	6
12	30082.A0209	Pinion Adjusting Shim .....	A/R
13	30082.A0210	Pinion Adjusting Shim .....	A/R
14	30082.A0211	Pinion Adjusting Shim .....	A/R
15	30082.A0212	Hex. Socket BSP TR Plug .....	2
16	30082.A0213	Brake Pipe Adaptor .....	2
17	49S.2	"O" Ring .....	2
18	30082.A0269	Dowty Washer .....	2
19	30082.A0214	Relief Valve .....	1
20	8S.5E	Bolt .....	12
21	59S.04	Nyloc Nut .....	12
22	30082.A0215	Brake Bleed Valve .....	2
23	30082.A0268	"O" Ring .....	2
24	30082.A0216	Stub Axle .....	2
25	30082.A0217	Oil Seal Housing .....	2
26	30082.A0218	Hub Oil Seal .....	2
27	30082.A0219	Hub .....	2
28	30082.A0220	Hub Inner Bearing .....	2
29	30082.A0221	Hub Outer Bearing .....	2
30	30082.A0222	Hub Bearing Spacer .....	2
31	30082.A0223	Bearing Lock Nut .....	2
32	30082.A0224	Tab Washer .....	2
33	30082.A0267	Stud .....	16
34	59S.04	Nyloc Nut .....	16
35	30082.A0225	Wheel Stud .....	12
36	30082.A0226	Axle Shaft .....	2
37	30082.A0227	Label .....	1
38	15S.1A	Hammer Drive Screw .....	4
39	30082.A0266	Hex. Socket Button Hd. Screw .....	4
40	30082.A0228	Input Pinion Cartridge .....	1
41	30082.A0270	Spiral Bevel Wheel & Pinion Assy. ....	1
42	30082.A0230	Drive Flange .....	1
43	30082.A0231	Drive Flange Washer .....	1
44	30082.A0232	Drive Flange Nut .....	1
45	30082.A0233	Oil Seal Cover .....	1
46	30082.A0234	Pinion Bearing .....	2
47	30082.A0235	Pinion Bearing Spacer .....	1
48	30082.A0236	Pinion Oil Seal .....	2
49	30082.A0237	Diff Case Process Assembly R.H.....	1
51	30082.A0239	Diff Wheel .....	2
52	30082.A0240	Diff Pinion .....	4
53	30082.A0241	Diff Wheel Thrust Washer .....	2
54	30082.A0242	Diff Pinion Thrust Washer .....	4
55	30082.A0243	Diff Spider .....	1
56	30082.A0244	Diff Bearing .....	2
57	8S.4Q	Bolts .....	8
58	59S.03	Nyloc Nuts .....	8



**DRIVE AXLE (cont'd)**  
**(NEWAGE 351)**

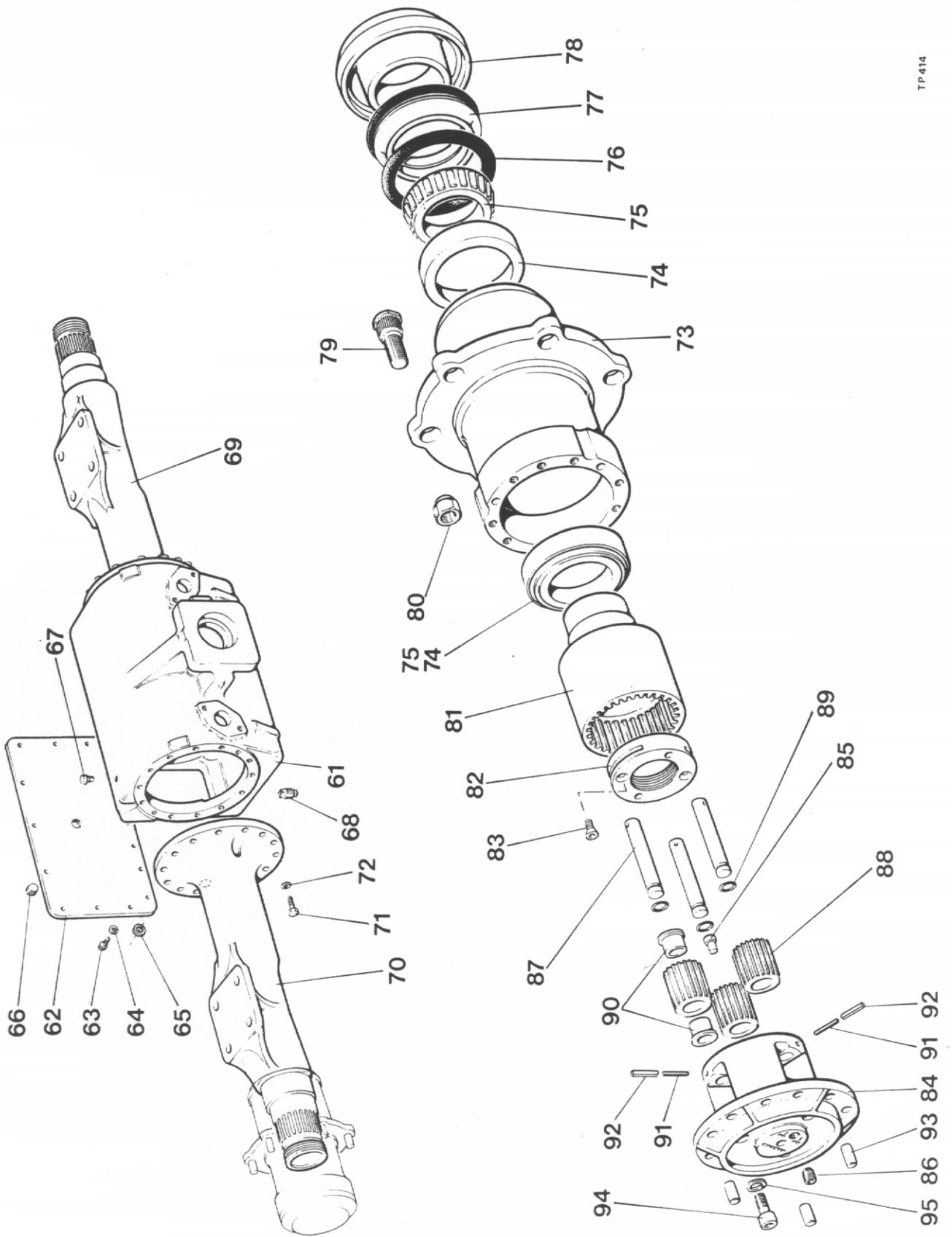
Item No.	Part No.	Description	Qty. Per Axle
59	30082.A0245	Planet Carrier .....	2
60	30082.A0246	Carrier Drive .....	2
61	30082.A0247	Planet Gear .....	6
62	30082.A0248	Planet Pin .....	6
63	30082.A0249	Planet Thrust Washer .....	12
64	30082.A0250	Planet Carrier Bush .....	6
65	30082.A0251	Axle Shaft Thrust Spacer .....	2
66	30082.A0252	Planet Cage Roller .....	6
67	30082.A0253	Spring Dowel .....	6
68	30082.A0265	Circlip .....	2
69	30082.A0254	Brake Cylinder R.H.....	1
70	30082.A0255	Brake Cylinder L.H.....	1
71	30082.A0256	Brake Piston .....	2
72	30082.A0257	Piston Oil Seal - Set .....	2
73	30082.A0259	Bearing Adjusting Nut .....	2
74	30082.A0260	Adjusting Nut Lock Plate .....	2
75	30082.A0261	Screw Lock Plate .....	4
76	30082.A0262	Planet Carrier Bolt .....	6
77	30082.A0263	Diff. Case L.H.....	1
78	10668A02	Wheel Nut .....	12



## DRIVE AXLE

### DIFFERENTIAL, HALF-SHAFTS AND BRAKE ASSEMBLY

Item No.	Part No.	Description	Qty.
	30179.A02	Axle complete .....	1
1	30090.A0101	Flange Coupling .....	1
2	30090.A0104	Oil Seal .....	1
3	30090.A0106	Cup - Bearing .....	2
4	30090.A0105	Cone - Bearing .....	2
5	30090.A0107	Spacer .....	1
6	30090.A0108	Shim .05mm (.002") .....	A/R
6	30090.A0109	Shim .13mm (.005") .....	A/R
6	30090.A0110	Shim .25mm (.010") .....	A/R
7	30090.A0103	Nut .....	1
8	30090.A0102	Washer .....	1
9	30179.A0223	Pinion - Spiral Bevel } Matched Pair .....	1
9		Wheel - Spiral Bevel } .....	1
10	30179.A0214	Trunnion Spider .....	1
	30179.A0220	Trunnion Wheel & Pinion Assembly (Comp. items 11 & 12 ) .....	1
11		Pinion - Spider } Only supplied as .....	4
12		Wheel - Spider } Assembly .....	2
13	30090.A0115	Washer - Thrust .....	2
	30179.A0221	Differential Cage Assembly (Comp. items 14 & 15).	1
14		Cage - Bossed } Matched Pair .....	1
15		Cage - Recessed } .....	1
16	30179.A0215	Washer .....	4
17	8S.4P	Bolt - Differential Cage .....	8
18	61S.4	Nut - Differential Cage .....	8
19	30090.A0119	Cup - Bearing - Differential Cage .....	2
20	30090.A0118	Cone - Bearing - Differential Cage .....	2
21	30090.A0177	Nut - Adjusting .....	2
22	30090.A0120	Housing .....	2
23	30090.A0141	Pin - Roll .....	4
24	11S.4D	Setscrew - Housing .....	16
25	17S.5	Washer - Spring - Housing .....	16
	30179.A0222	Brake Assembly (Comp. items 26,27 & 28) .....	2
26	30090.A0122	Actuator .....	2
27	30090.A0175	Plate - Middle .....	8
28	30090.A0176	Plate - Intermediate .....	4
29	30090.A0123	Pin - Torque .....	2
30	30090.A0124	Pin - Retaining .....	2
31	30090.A0125	Cover - Torque Pin .....	2
32	30179.A0203	Shaft - Drive .....	2
33	30090.A0131	Cylinder - Brake .....	2
34	30090.A0127	Rod - Pull .....	2
35	30090.A0128	Pin - Pull Rod .....	2
36	30090.A0129	Circlip - Pull Rod Pin .....	2
37	30090.A0130	Bleedscrew .....	2
38	30090.A0132	Seal - Internal .....	2
39	30090.A0133	Spacer .....	2
40	30090.A0134	Seal - External .....	2
41	30090.A0135	Piston .....	2
42	30090.A0178	Nut .....	2
43	7S.4	Nut - Locking .....	2
44	30090.A0136	Spring .....	2
45	30090.A0137	Cap - End .....	2
46	11S.3B	Setscrew .....	4
47	17S.4	Washer - Spring .....	4
48-60		Reserved for possible additions	

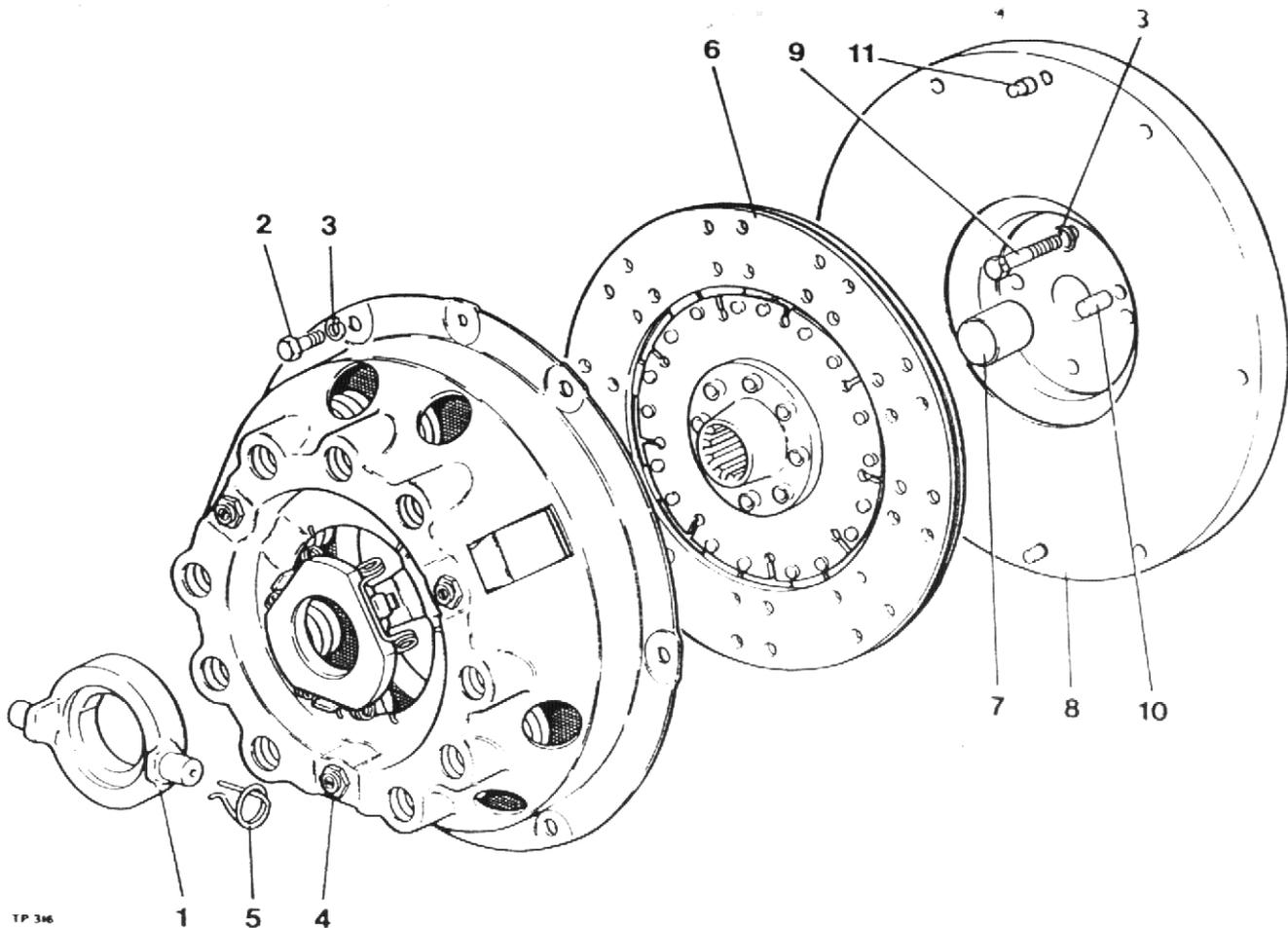


DRIVE AXLE (Cont'd.)

CASING AND HUB ASSEMBLY

Item No.	Part No.	Description	Qty
	30179.A02	Axle complete .....	1
61	30090.A0167	Casing - Axle .....	1
62	30090.A0165	Cover - Axle Casing .....	1
63	11S.3A	Setscrew - Axle Cover .....	16
64	17S.4	Washer - Spring .....	9
65	30090.A0151	Washer .....	7
66	30090.A0164	Plug - Level .....	1
67	30097.A0171	Breather .....	1
68	30097.A0170	Plug - Magnetic Drain .....	1
69	30179.A0202	Arm - Mounting L.H.....	1
70	30179.A0201	Arm - Mounting R.H.....	1
71	8S.4B	Bolt - Mounting Arm .....	28
72	17S.5	Washer - Spring - Mounting Arm .....	28
	30179.A0218	Hub Assembly (comp. items 73,74,75&79) .....	2
73	30179.A0204	Hub .....	2
74	30090.A0156	Cup - Bearing - Hub .....	4
75	30090.A0157	Cone - Bearing - Hub .....	4
76	30090.A0161	"O" Ring - Hub .....	4
77	30090.A0162	Oil Seal - Hub .....	2
78	30090.A0163	Distance Piece .....	2
79	30179.A0213	Stud - Wheel .....	12
80	CSE 197	Nut - Wheel Stud .....	12
81	30179.A0207	Annulus .....	2
82	30179.A0216	Nut - Hub .....	2
83	30179.A0217	Screw Csk. Hub Retaining .....	4
	30179.A0219	Planet Carrier Assembly (comp. items 84,85,87,88 89,90,91 & 92) .....	2
84	30179.A0208	Carrier - Planet .....	2
85	30090.A0144	Button - Thrust .....	2
86	30090.A0139	Plug - Carrier .....	2
87	30179.A0209	Pin - Planet Gear .....	6
88	30179.A0211	Gear - Planet .....	6
89	30090.A0143	"O" Ring - Planet Gear Pin .....	6
90	30179.A0212	Bush .....	12
91	30090.A0141	Pin - Retaining - Inner - Planet Gear Pin .....	6
92	30090.A0172	Pin - Retaining - Outer - Planet Gear Pin .....	6
93	30090.A0138	Dowel - Carrier to Hub .....	6
94	68S.5D	Capscrew - Carrier to Hub .....	24
95	17S.5	Washer - Spring - Carrier to Hub .....	24

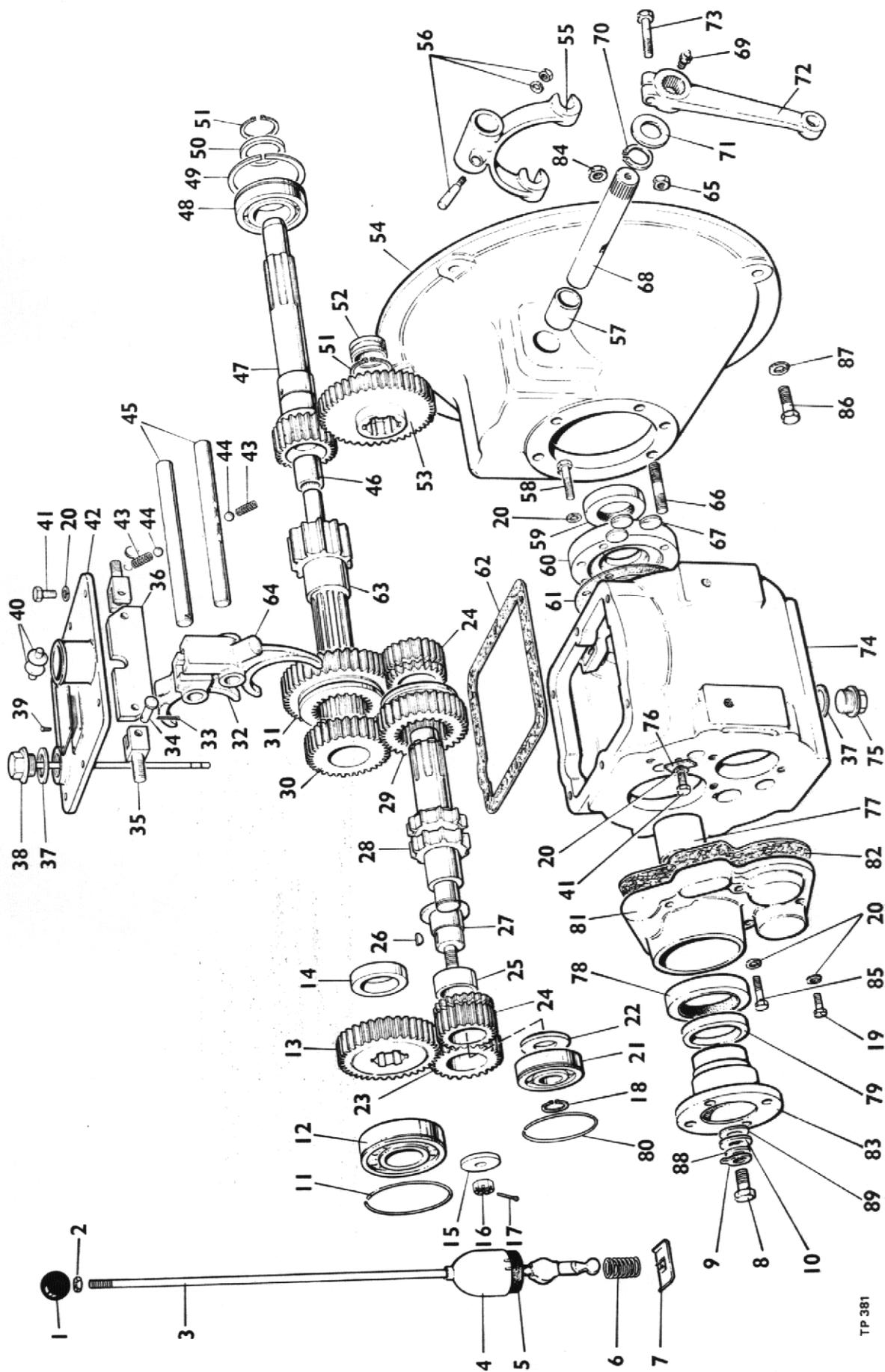
# FLYWHEEL & CLUTCH



TP 346

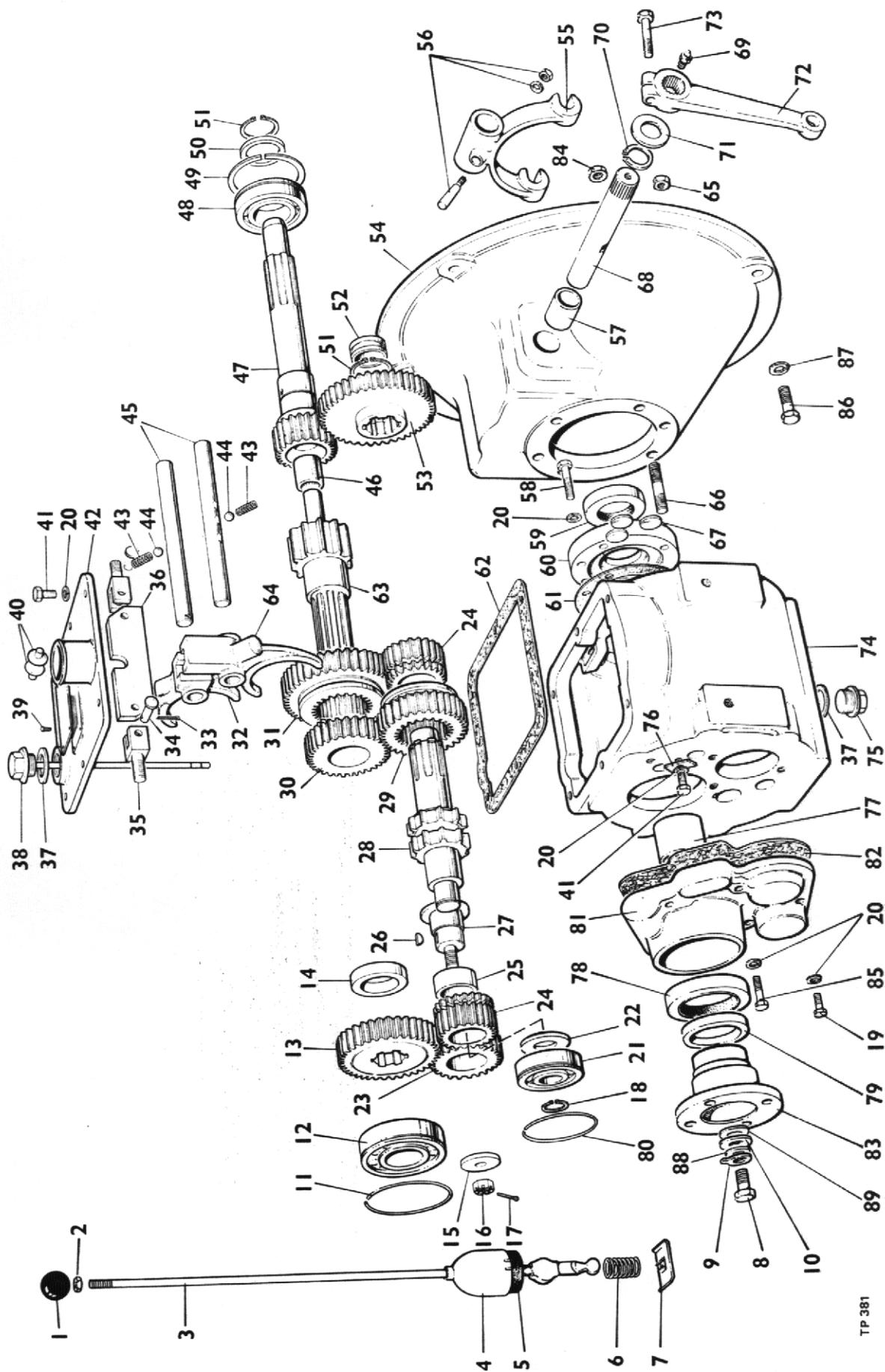
Item No.	Part No.	Description	Qty.
1	10579A01	Clutch Release Bearing	1
2	28S02D	Screw Set	6
3	41S04	Washer Spring	10
4	10597A02	Cover Assembly 9"	1
5	10579A0101	Retainer Spring	2
6	10598A03	Drive Plate 9"	1
7	10580A0101	Bush	1
8	10580A01	Flywheel Assembly 9" (comprises of items 7, 8, & 11)	1
9	1S02C	Bolt, Petter PH Engine (drill for locking wire)	4
9A	6S02B	Bolt, Lister Engine (drill for locking wire)	4
10	C321	Dowel	1
11	10580A0102	Dowel	2
	10948A03	Clutch Kit 9" (comprises of items 1, 4, 5 & 6)	1

It is recommended that instead of drilling the head of the bolts (item 9/9A) for locking wire that one of each of tabwashers part no's 10531A02 and 10531A03 are used to prevent the bolts working loose.



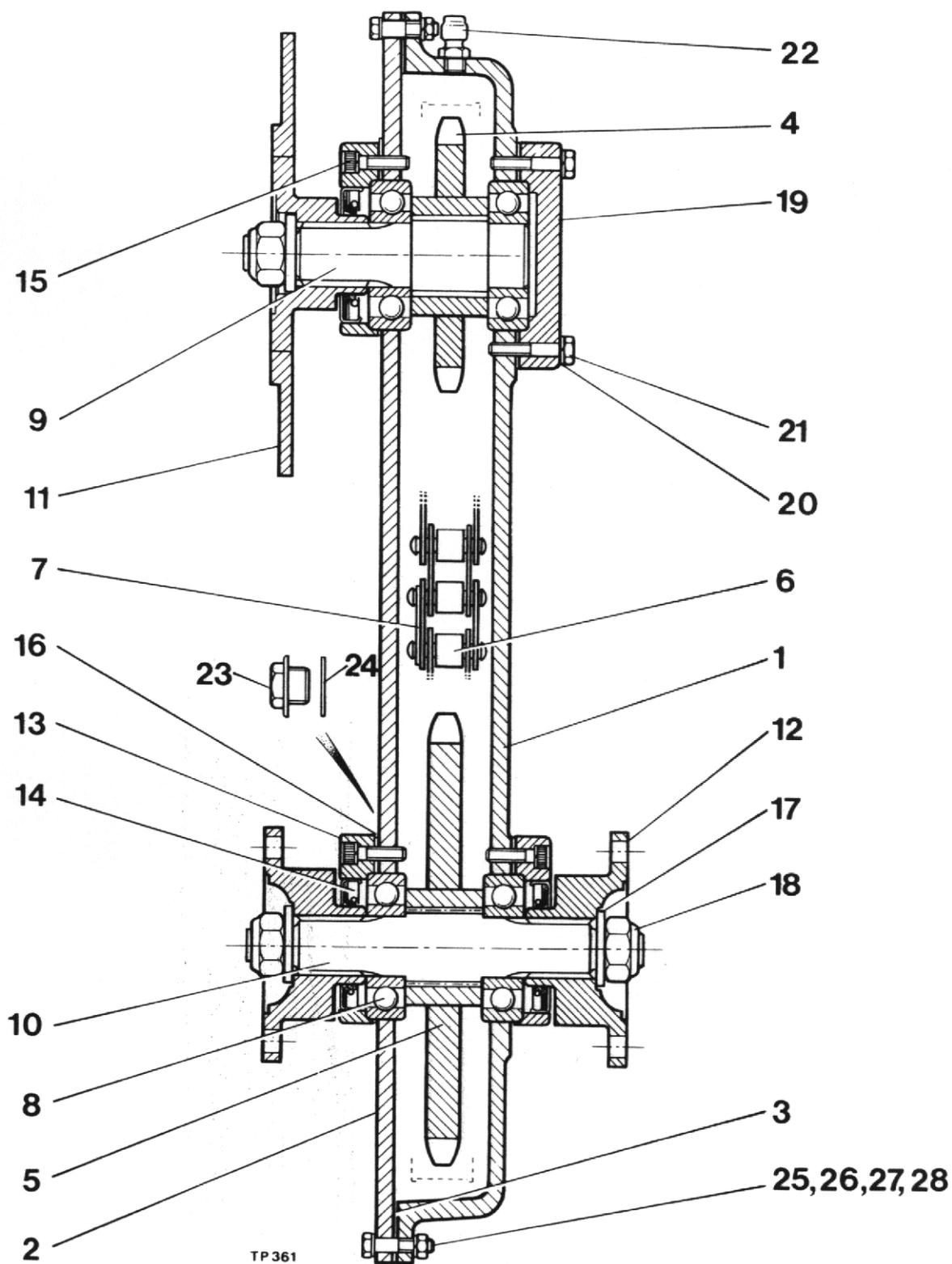
## GEARBOX

Item No.	Part No.	Description	Qty.
	30101.A02	Gearbox complete .....	1
1	30101.A0201	Gear Lever Knob .....	1
2	95S.3	Gear Lever Locknut .....	1
3	30101.A0202	Gear Lever .....	1
4	30101.A0203	Gear Lever Cap .....	1
5	30101.A0204	Gear Lever Cover .....	1
6	30101.A0205	Gear Lever Spring .....	1
7	30101.A0206	Gear Lever Retaining Plate .....	1
8	28S.5E	Bolt .....	1
9	30101.A0207	Tab Washer .....	1
10	30101.A0208	Washer .....	1
11	30101.A0209	Snap Ring .....	1
12	30101.A0210	Bearing, Mainshaft Rear .....	1
13	30101.A0211	Output Gear .....	1
14	30101.A0212	Output Gear Spacer .....	1
15	30101.A0213	Reverse Pinion Shaft Washer .....	1
16	102S.4	Reverse Spindle Nut .....	1
17	44S.2C	Split Pin .....	1
18	30101.A0215	Circlip .....	1
19	28S.1D	Bolt .....	3
20	13S.2	Spring Washer .....	17
21	30101.A0216	Layshaft Bearing .....	1
22	30101.A0217	Bearing Spacer .....	1
23	30101.A0218	Reverse Pinion .....	2
24	30101.A0219	Reverse Speed Gear .....	2
25	30101.A0220	Reverse Pinion Bush .....	1
26	30101.A0221	Reverse Pinion Shaft Key .....	1
27	30101.A0222	Reverse Pinion Shaft .....	1
28	30101.A0223	Layshaft .....	1
29	30101.A0224	2nd. Speed Sliding Gear .....	1
30	30101.A0225	Second Speed Gear .....	1
31	30101.A0226	1st Speed Gear .....	1
32	30101.A0227	2nd. and 3rd. Selector Fork .....	1
33	44S.1C	Split Pin, Interlock .....	2
34	30101.A0228	Clevis Pin, Interlock .....	2
35	30101.A0229	Stud, Interlock .....	2
36	30101.A0230	Interlock Plate .....	1
37	42S.5	Sealing Washer .....	2
38	30101.A0232	Dipstick .....	1
39	30101.A0233	Drive Screw .....	4
40	30101.A0234	Gear Lever Pad .....	2
41	28S.1C	Bolt .....	7
42	30101.A0235	Top Cover .....	1
43	30097.A0185	Detent Spring .....	2
44	30101.A0236	Detent Ball .....	2
45	30101.A0237	Selector Shaft .....	2
46	30101.A0238	Bearing, Primary Shaft .....	1
47	30101.A0239	Primary Shaft .....	1
48	30101.A0240	Input Bearing .....	1
49	30101.A0241	Snap Ring .....	1
50	30101.A0242	Bearing Spacer .....	1
51	30101.A0243	Circlip .....	2
52	30101.A0244	Layshaft Bush .....	1
53	30101.A0245	1st. Reduction Gear .....	1



## GEARBOX (Cont'd)

Item No.	Part No.	Description	Qty.
54	30101.A0246	Clutch Housing .....	1
55	30097.A0110	Clutch Release Fork .....	1
56	30097.A0111	Cotter, Nut and Washer S/A .....	1
57	30097.A0114	Cross Shaft Bush .....	2
58	6S.1A	Front Cover Bolt .....	4
59	30101.A0247	Oil Seal, Input .....	1
60	30101.A0248	Front Cover .....	1
61	30101.A0249	Front Cover Gasket .....	1
62	30101.A0250	Top Cover Gasket .....	1
63	30101.A0251	Mainshaft .....	1
64	30101.A0252	1st. and Reverse Selector Fork .....	1
65	9S.1	Clutch Lever Nut .....	1
66	30101.A0253	Clutch Housing Stud .....	6
67	30101.A0254	Welch Plug .....	3
68	30101.A0255	Clutch Cross Shaft .....	1
69	131S.1	Grease Nipple .....	2
70	30101.A0256	Circlip .....	1
71	30097.A0133	Cross Shaft Washer .....	1
72	30097.A0109	Clutch Release Lever .....	1
73	6S.1C	Clutch Lever Bolt.....	1
74	30101.A0258	Gearcase .....	1
75	30097.A0163	Drain Plug .....	1
76	30101.A0259	Selector Locking Strip .....	1
77	30101.A0260	Spacer .....	1
78	30097.A0132	Rear Oil Seal .....	1
79	30101.A0265	Dust Shield .....	1
80	30101.A0261	Snap Ring .....	1
81	30101.A0262	Output Cover .....	1
82	30101.A0263	Output Cover Gasket .....	1
83	30101.A0264	Coupling .....	1
84	107S.3	Nut (Clutch Housing) .....	6
85	6S.1	Bolt .....	2
86	1S.3B	Bolt 3/8" BSF x 1" Long .....	6
87	41S.5	Spring Washer 3/8" dia. ....	6
88	30143.A0111	Fibre Washer .....	1
89	30143.A0101	Fibre Washer .....	1

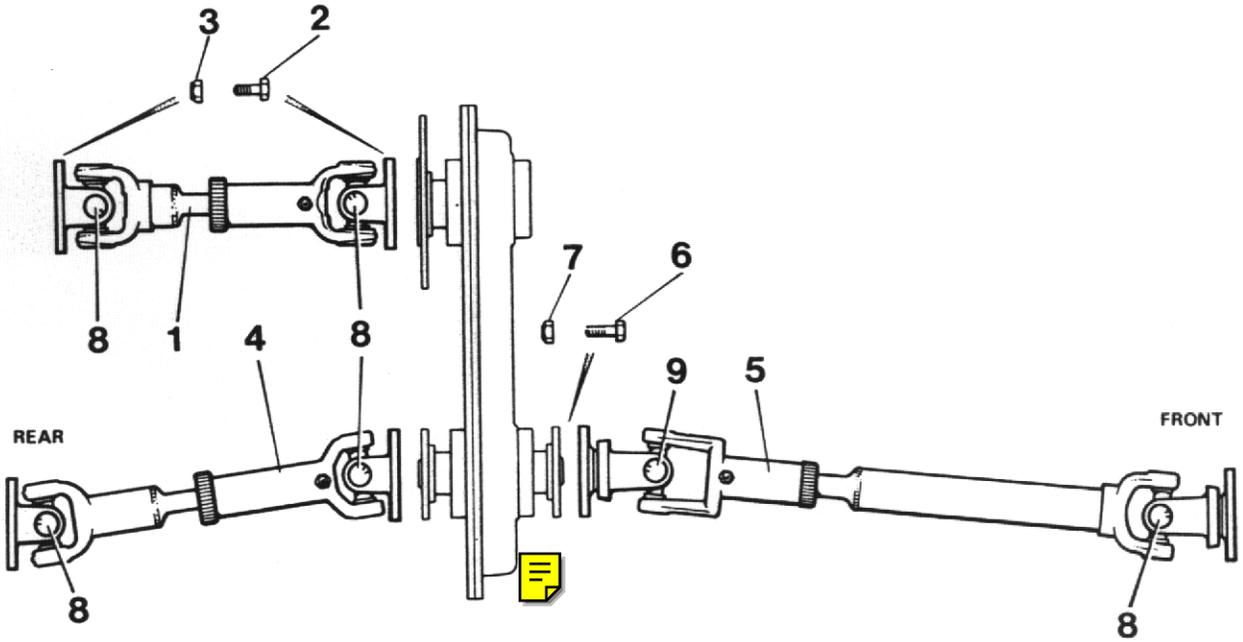


TP 361

## TRANSFER BOX

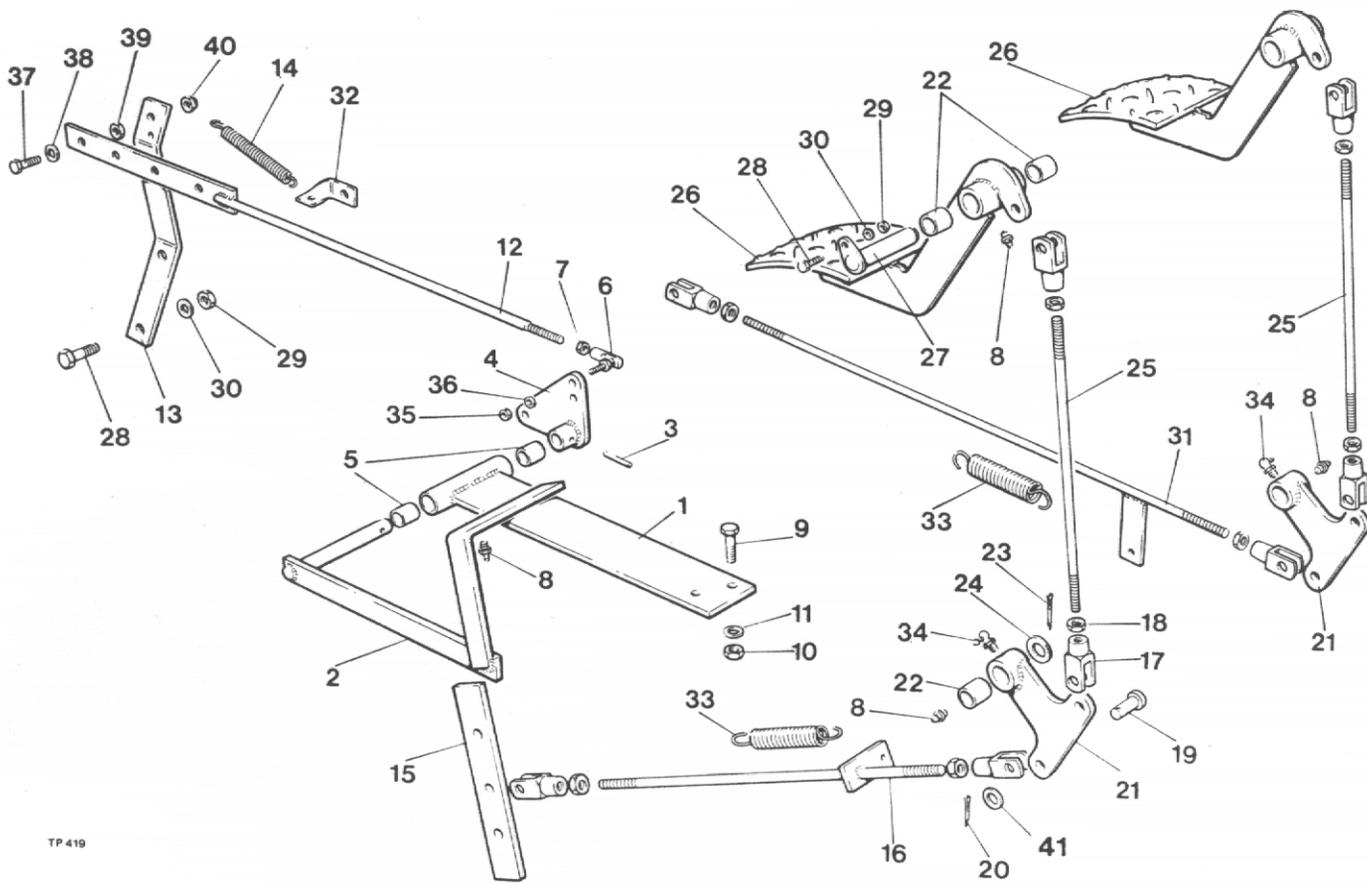
Item No.	Part No.	Description	Qty.
	40054.A01	Transfer Box Complete .....	1
1	40061.A01	Case .....	1
2	40062.A01	Cover Plate .....	1
3	30072.A01	Gasket .....	1
4	10294.A01	Chain Wheel (15T) .....	1
5	20076.A01	Chain Wheel (26T) .....	1
6	80S.1	Roller Chain .....	1
7	81S.1	Chain Connecting Link .....	1
8	98S.6	Ball Bearing .....	4
9	4-60-252	Input Shaft .....	1
10	4-60-253	Output Shaft .....	1
11	20109.A01	Input Flange Assembly (c/w Handbrake Disc)..	1
12	10297.A01	Output Flange .....	2
13	4-35-102	Oil Seal Housing .....	3
14	89S.1	Oil Seal .....	3
15	90S.02H	Cap Screw $\frac{1}{2}$ " UNF x 1" Long .....	12
16	10293.A01	Gasket .....	4
17	10S.6	Washer $\frac{3}{4}$ " Dia. ....	3
18	87S.8	Locknut $\frac{3}{4}$ " UNF .....	3
19	10298.A01	End Cover .....	1
20	10S.1	Washer $\frac{1}{4}$ " Dia. ....	4
21	6S.1A	Hex. Hd. Bolt $\frac{1}{4}$ " UNF x 1 $\frac{1}{8}$ " Long .....	4
22	10305.A01	Breather .....	1
23	10301.A01	Level/Filler Plug .....	1
24	42S.5	Fibre Washer $\frac{1}{2}$ " BSP .....	1
25	8S.2C	Hex. Hd. Bolt M6 x 35 Long .....	24
26	12S.2A	Washer M6 .....	24
27	17S.3A	Spring Washer M6 .....	24
28	7S.2A	Nut M6 .....	24

# PROP. SHAFTS



TP 362

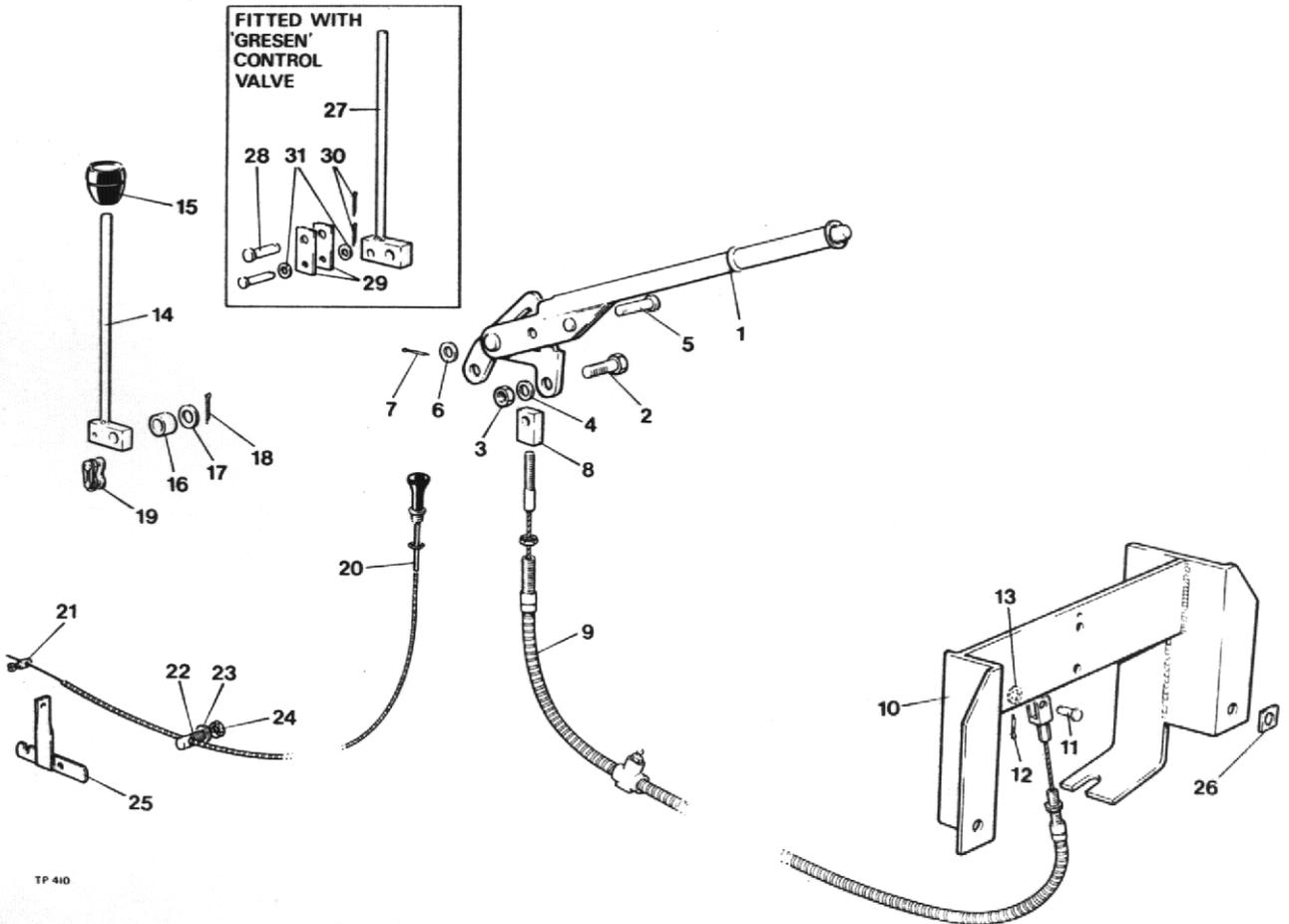
Item No.	Part No.	Description	Qty.
1	20089.A01	Prop Shaft .....	1
2	10365.A02	Prop Shaft Bolt.....	8
3	132S.4	Nut 3/8" UNF "Binx" .....	8
4	10342.A01	Prop Shaft .....	1
5	40077.A01	Prop Shaft .....	1
6	ESE 214	Prop Shaft Bolt .....	16
7	87S.4	Nut 7/16" UNF .....	16
8	10568.A01	Repair Kit (Std. Angle)	A/R
9	10568.A02	Repair Kit (Wide Angle)	A/R



## PEDAL CONTROLS

Item No.	Part No.	Description	Qty.
1	20118.A01	Mounting Plate .....	1
2	20104.A01	Accelerator Pedal .....	1
3	54S.1A	Tension Pin .....	1
4	10552.A01	Accelerator Lever .....	1
5	WB 0808	Bush .....	2
6	C160B	Rod Ball End .....	1
7	74S.2	Half Nut.....	2
8	131.S3	Grease Nipple .....	5
9	11S.4E	Bolts Hex Hd. M10 x 35 Long.....	2
10	7S.4	Nut M10 .....	2
11	17S.5	Spring Washer M10 .....	2
12	20166.A01	Accelerator Rod .....	1
13	10311.A01	Speed Control Arm .....	1
14	C173D	Spring .....	1
15	20117.A02	Brake Compensator .....	1
16	10518.A01	Compensator Rod .....	1
17	C.174A	Clevis .....	8
18	74S.4	Nut 3/8" BSF .....	8
19	10650.A17	Clevis Pin .....	8
20	44S.2C	Split Pin 3/32" x 1" Long .....	8
21	20111.A01	Bell Crank .....	2
22	WB 1212	Bush .....	6
23	44S.3C	Split Pin .....	2
24	10S.6	Washer 3/4" dia.....	2
25	38S.C59	Rod 3/8" x 270mm Long .....	2
26	20096.A03	Pedal .....	2
27	10368.A01	Pedal Pivot Pin.....	2
28	64S.2B	Setscrew Hex. Hd. M6 x 15 Long .....	3
29	65S.2	Nut M6 .....	3
30	17S.3	Spring Washer M6 .....	3
31	10481.A02	Clutch Rod.....	1
32	C.163	Bracket .....	1
33	C.173B	Spring .....	2
34	131S.2	Grease Nipple .....	2
35	2S.2	Nut 1/2" BSF .....	1
36	61S.1	Shakeproof Washer 1/4" .....	1
37	6S.1B	Bolt Hex. Hd. 1/4" UNF x 1 1/2" Long .....	1
38	10S.1	Washer .....	1
39	9S.1	Nut .....	1
40	87S.1	Nut - Self Locking .....	1
41	10S.3	Washer 3/8" dia. ....	8

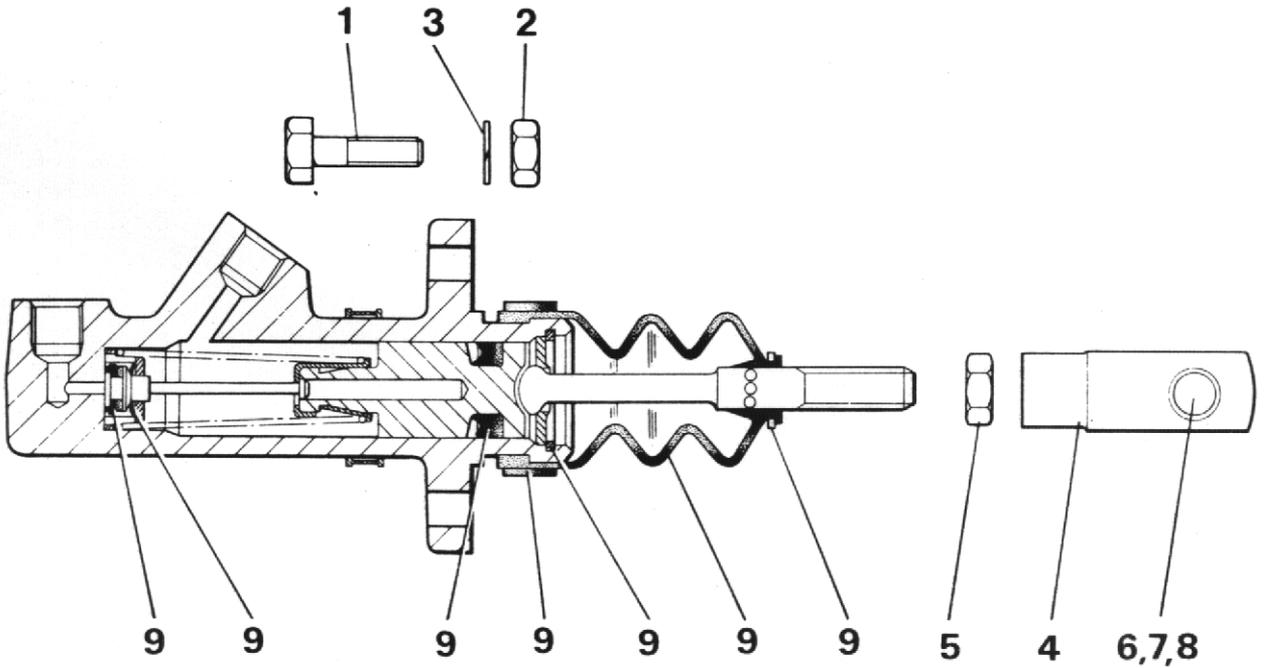
## VALVE CONTROL, HANDBRAKE AND ENGINE STOP



TP 410

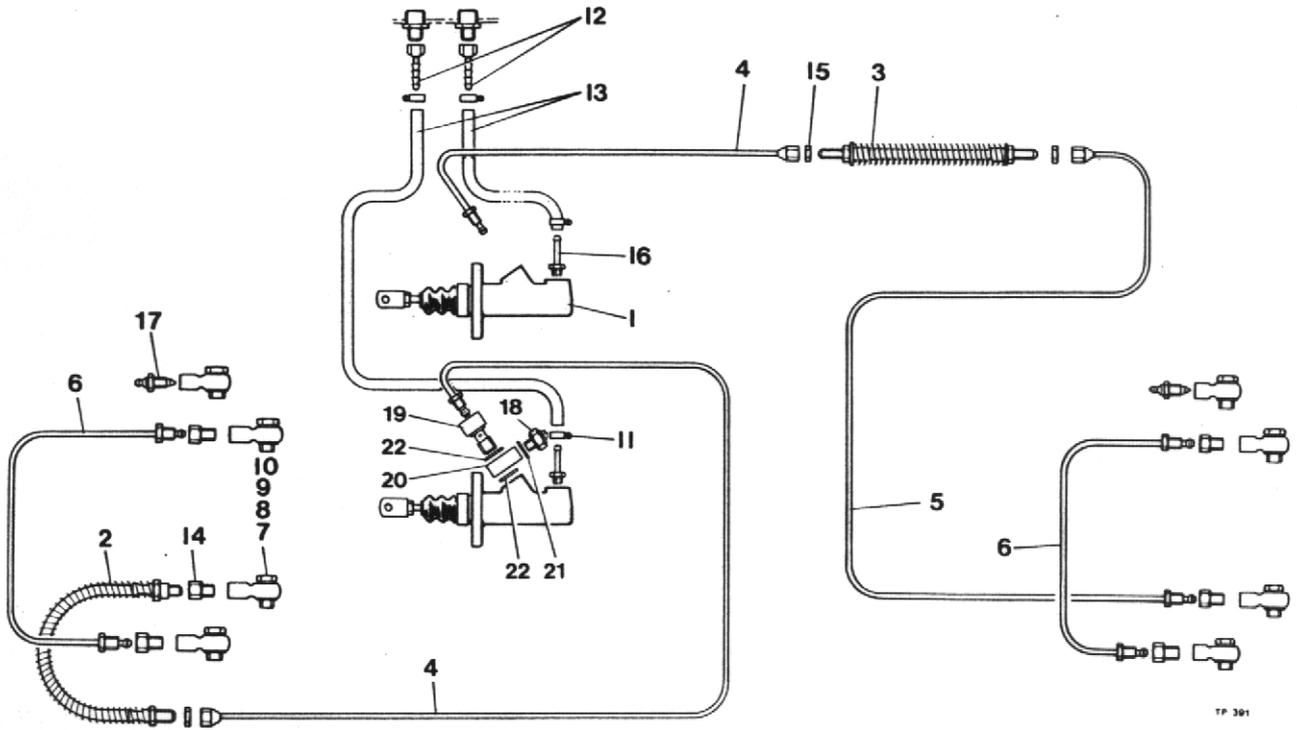
Item No.	Part No.	Description	Qty.
1	10596.A01	Handbrake Lever.....	1
2	11S.4C	Setscrew M10 x 25 Long.....	2
3	7S.4	Nut M10.....	2
4	17S.5	Washer-Spring M10.....	2
5	10650.A19	Pin.....	1
6	10S.3	Washer-Plain 3/8" Dia.....	1
7	44S.2B	Split Pin 3/32" x 3/4" Long .....	1
8	L.309	Block-Brake Cable .....	1
9	10367.A01	Handbrake Cable .....	1
10	30124.A01	Brake Caliper Bracket .....	1
11	10650.A13	Clevis Pin Brake Cable .....	1
12	44S.1C	Split Pin .....	1
13	10S.1	Washer-Plain - Brake Cable Clevis Pin .....	1
14	10520.A01	Control Valve Lever (Cessna Valve) .....	1
15	10211.A01	Knob - Valve Lever .....	1
16	10647.A01	Spacer .....	1
17	10S.3	Washer Plain 3/8" dia. ....	1
18	44S.2C	Split Pin 3/32" x 3/4" .....	1
19	4-60-178	Connecting Link (Cessna Valve) .....	1
20	4-60-239	Engine Stop Control Cable .....	1
21	4-35-196	Solderless Nipple & Screw .....	1
22	4-60-242	Clamp Screw .....	1
23	67S.4	Washer - Shakeproof Int. ....	1
24	9S.3	Nut 3/8" UNF .....	1
25	10346.A01	Overload/Stop Control Lever (Lister) .....	1
26	10604.A01	Spacer (if fitted).....	A/R
27	10520.A02	Control Valve Lever Assy.(Gresen)(when fitted) ...	1
28	10650.A18	Clevis Pin (when fitted) .....	1
29	30180.A0103	Link (when fitted) .....	2
30	44S.2B	Split Pin (when fitted) .....	2
31	10S.1	Washer - Plain (when fitted) .....	2

# BRAKE MASTER CYLINDER



Item No.	Part No.	Description	Qty.
	20102.A02	Master Cylinder .....	2
1	11S.3E	Bolts Hex. Hd. M8 x 35 Long .....	4
2	7S.3	Nuts M8 .....	4
3	17S.4	Spring Washer .....	4
4	C174J	Clevis .....	2
5	95S.3	Nut 3/8" UNF Thin Nut .....	2
6	C174Y	Clevis Pin .....	2
7	10S.2	Washer 5/16" .....	2
8	44S.2C	Split Pin 3/32" x 1" Long .....	2
9	10570.A01	Service Kit .....	A/R

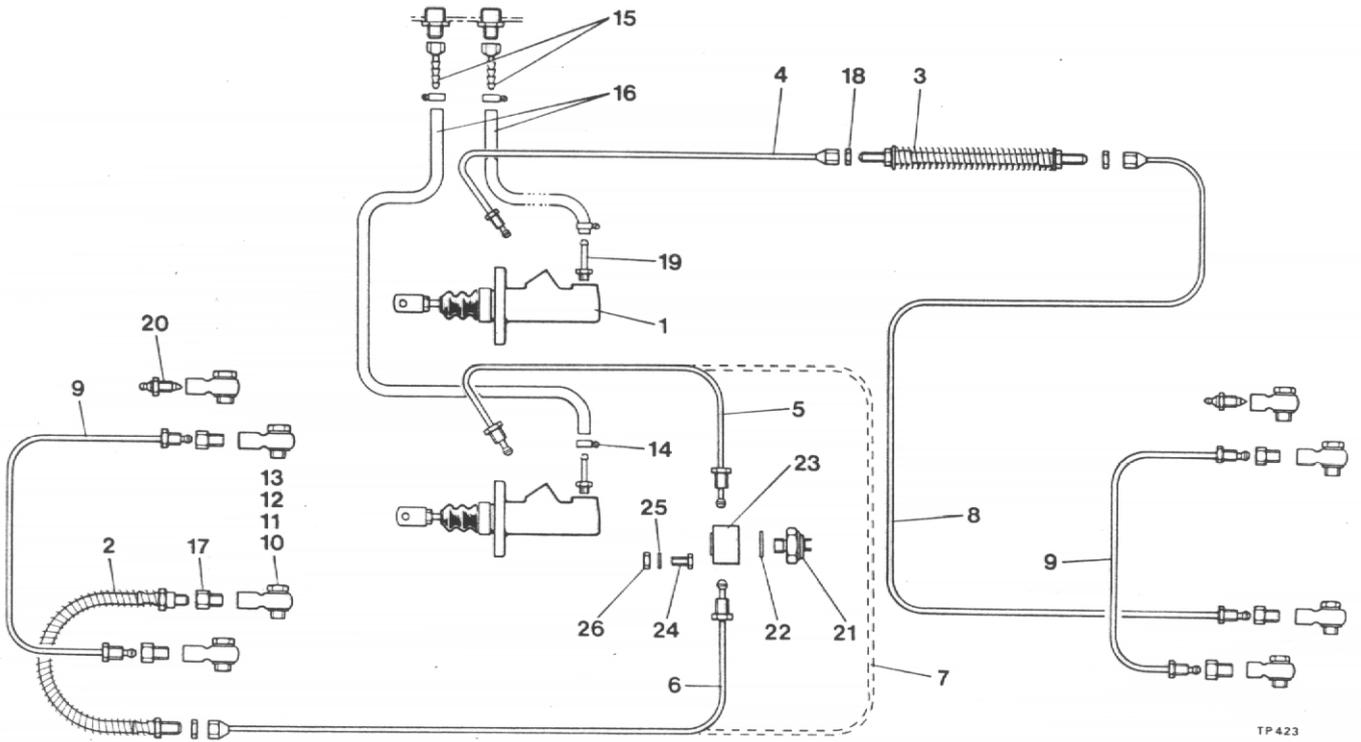
**BRAKE PIPES AND FITTINGS  
(NEWAGE AXLE)**



TP 391

Item No.	Part No.	Description	Qty.
1	20102.A02	Master Cylinder .....	2
2	10516.A02	Flexible Brake Hose .....	1
3	10517.A02	Flexible Brake Hose .....	1
4	10577.A0101	Brake Pipe M12 x 770 Long Male/Female .....	2
5	10577.A0102	Brake Pipe M12 x 965 Long Male/Female .....	1
6	10577.A0106	Brake Pipe M12 x 425 Long Male/Male .....	2
7	64474287	Banjo .....	8
8	376102W	Banjo Bolt .....	8
9	378700	Washer .....	8
10	378703	Washer .....	8
11	97S.1	Pipe Clip .....	4
12	110S.1A	Nozzle 1/4" BSP .....	2
13	29S.7	Hose 1/4" Bore x 1000mm Long .....	2
14	10354.A02	Brake Pipe Adaptor .....	6
15	10582A01	Half Nut M12 .....	3
16	10542.A01	Stub Pipe Assembly .....	2
17	30082.A0215	Brake Bleed Valve (see also Axle section) (N.I.).....	2
18	10744A01	Brake Switch (if fitted) .....	1
19	10656.A01	Special Bolt (if fitted) .....	1
20	10657.A01	Connector (if fitted) .....	1
21	378703	Washer (if fitted) .....	1
22	10661.A01	Washer (if fitted) .....	2

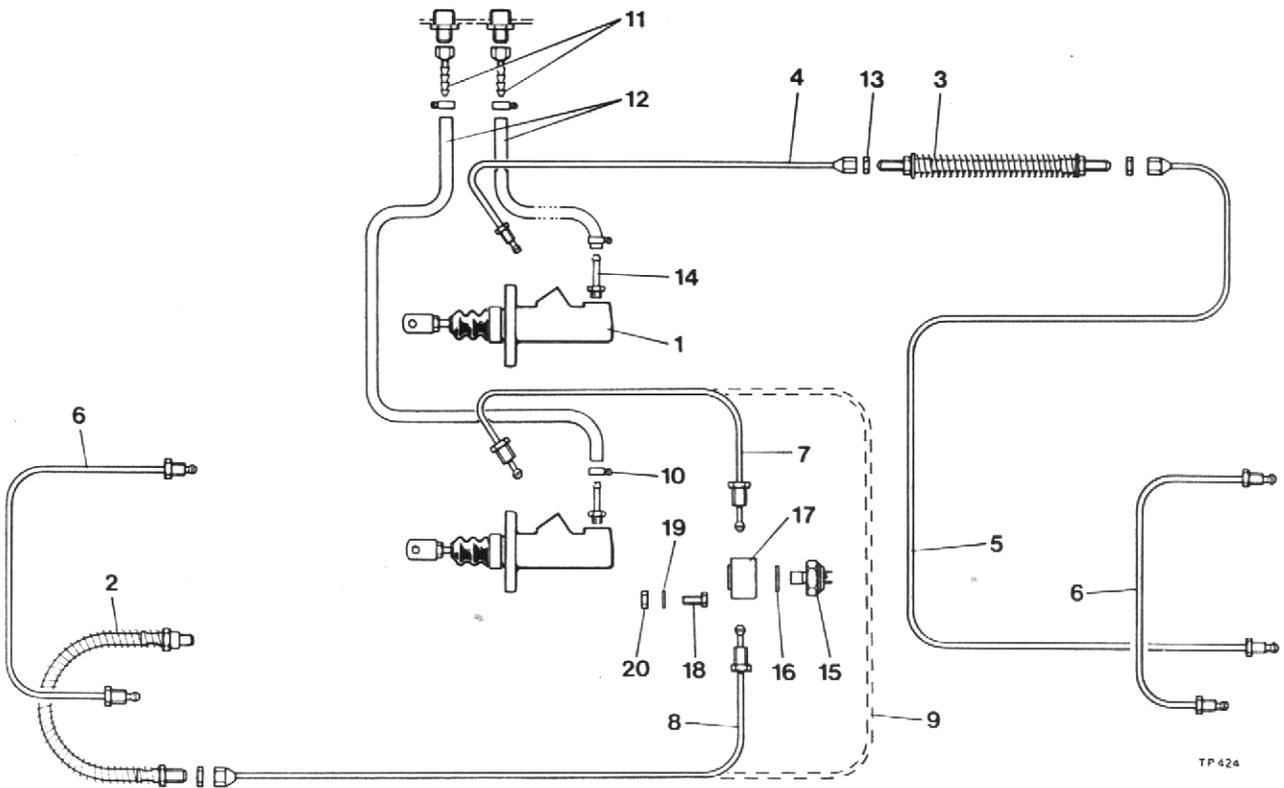
## BRAKE PIPES AND FITTINGS (NEWAGE AXLE)



TP 423

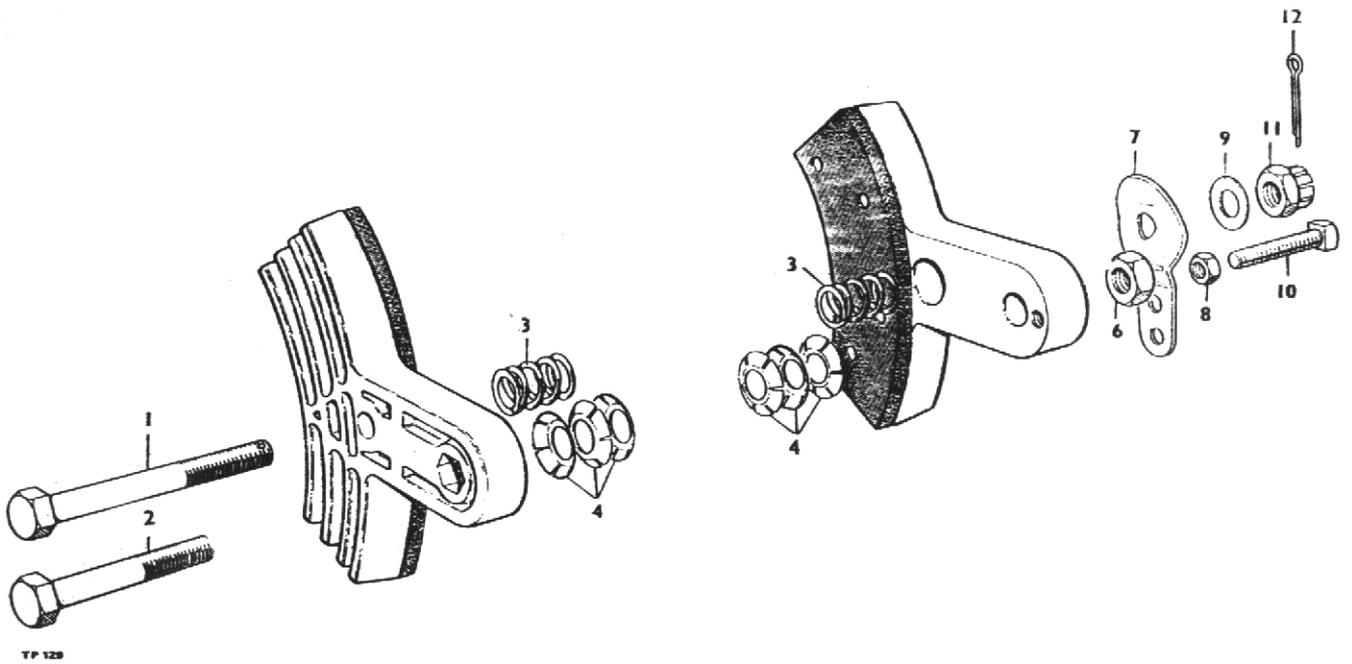
Item No.	Part No.	Description	Qty.
1	20102.A02	Master Cylinder .....	2
2	10516.A02	Flexible Brake Hose .....	1
3	10517.A02	Flexible Brake Hose .....	1
4	10577.A0101	Brake Pipe M12 x 770 Long Male/Female .....	1
5	10577.A0203	Brake Pipe M12 x 500 Long Male/Male (when fitted)	1
6	10577.A0106	Brake Pipe M12 x 465 Long Male/Female (when fitted)	1
7	10577.A0101	Brake Pipe M12 x 770 Long Male/Female (when fitted)	1
8	10577.A0102	Brake Pipe M12 x 965 Long Male/Female .....	1
9	10577.A0202	Brake Pipe M12 x 425 Long Male/Male .....	2
10	114S.1	Banjo .....	8
11	115S.1	Banjo Bolt .....	8
12	116S.2	Washer .....	8
13	116S.1	Washer .....	8
14	97S.1	Pipe Clip .....	4
15	110S.1A	Nozzle 1/4" BSP .....	2
16	29S.7	Hose 1/4" Bore x 1000mm Long .....	2
17	10354.A02	Brake Pipe Adaptor .....	6
18	10582.A01	Half Nut M12 .....	3
19	10542.A01	Stub Pipe .....	2
20	30082.A0215	Brake Bleed Valve (see also Axle section) .....	2
21	10744.A01	Brake Switch (when fitted) .....	1
22	116S.2	Copper Washer (when fitted) .....	1
23	10387.A01	Brake Switch Adaptor (when fitted) .....	1
24	8S.2A	Bolt M6 x 25mm Long (when fitted) .....	1
25	12S.14	Washer 6mm dia. (when fitted) .....	1
26	7S.2	Nut M6 (when fitted) .....	1

## BRAKE PIPES AND FITTINGS (HAMWORTHY AXLE)



TP 424

Item No.	Part No.	Description	Qty.
1	20102.A02	Master Cylinder .....	2
2	10516.A02	Flexible Brake Hose .....	1
3	10517.A02	Flexible Brake Hose .....	1
4	10577.A0101	Brake Pipe M12 x 770 Long Male/Female .....	1
5	10577.A0102	Brake Pipe M12 x 965 Long Male/Female .....	1
6	10577.A0203	Brake Pipe M12 x 500 Long Male/Male .....	2
7	10577.A0203	Brake Pipe M12 x 500 Long Male/Male (when fitted)	1
8	10577.A0106	Brake Pipe M12 x 465 Long Male/Female (when fitted)	1
9	10577.A0101	Brake Pipe M12 x 770 Long Male/Female (when fitted)	1
10	97S.1	Pipe Clip .....	4
11	110S.1A	Nozzle 1/2" BSP .....	2
12	29S.7	Hose 1/2" Bore x 1000mm Long .....	2
13	10582.A01	Half Nut M12 .....	3
14	10542.A01	Stub Pipe .....	2
15	10744.A01	Brake Switch (when fitted) .....	1
16	116S.2	Copper Washer (when fitted) .....	1
17	10387.A01	Brake Switch Adaptor (when fitted) .....	1
18	8S.2A	Bolt M6 x 25mm Long (when fitted) .....	1
19	12S.14	Washer 6mm dia. (when fitted) .....	1
20	7S.2	Nut M6 (when fitted) .....	1



## CALIPER, parking brake

Item	Part no	Description	Qty
1A	10578A01	CALIPER, one pair, assembly	1
1	28S02T	SCREW	1
2	28S02P	SCREW	1
3	10578A0101	SPRING, centring	2
4	10578A0102	WASHER, tension	6
6	9S02	NUT	1
7	10578A0104	CAM	1
8	230S01	NUT, locking	1
9	10578A0105	WASHER	1
10	66S01H	SCREW, set	1
11	227S02	NUT, castle	1
12	44S01C	PIN, cotter	1
13	1072A4	PAD c/w rivets	2



## HYDRAULICS

Item No.	Part No.	Description	Qty.
1	30131.A01	Control Valve - Cessna .....	1
1	30180.A01	Control Valve - Gresen-Alternative .....	1
2	20110.A01	Steering Valve (Gemmer)(c/w Steering Wheel Nut) .	1
	8S.4A	Bolt Hex Hd. M10 x 25 Lg(Steer.Valve fixing Gemmer)	3
	13S.4	Shakeproof Washer (Steering Valve fixing Gemmer).	3
	CSE.182	Steering Valve Spacer " " " "	3
2	CSE.178	Steering Valve complete (Danfoss) .....	1
3	CSE.178-2	Steering Valve (Danfoss) .....	1
4	CSE.178-1	Steer.Column (Danfoss)(c/w Steering Wheel Nut)...	1
5	103S.4B	Capscrew 3/8" UNC x 3/4" Long.....	2
	69S.3G	Bolt 3/8" UNCx1½"Lg(Steering Valve fixing Danfoss)	2
	67S.4	Shakeproof Washer 3/8" dia. " " "	2
	CSE.182	Steering Valve Spacer(Steering " " " "	2
6	10590.A01	Pump (Petter) .....	1
7	30161.A01	Hydraulic Cylinder (Skip) .....	2
8	30121.A01	Hydraulic Cylinder (Steering) .....	1
9	36S.2FF	Hose 3/8" x 51" Lg. 90° x 90° @ 180° .....	1
10	31S.2D	Hose 3/8" x 112" Long ST x 90° .....	2
11	35S.2I	Hose 3/8" x 25" Long ST x ST .....	2
12	31S.2AA	Hose 3/8" x 20" Long ST x 90° .....	2
13	36S.2II	Hose 3/8" x 2265mm Long 90° x 90° @ 270° .....	1
14	31S.2G	Hose 3/8" x 77" Long ST x 90° .....	1
15	36S.2HH	Hose 3/8" x 77" Long 90° x 90° @ 135° .....	1
16	31S.2E	Hose 3/8" x 99" Long ST x 90° .....	1
17	35S.3U	Hose ½" x 790mm Long ST x ST .....	1
18	37S.1G	Hose 3/4" Cotton Braid x 30" Long .....	1
19	4-35-261	Flange .....	1
20	CSE 186	Adaptor, Short 7/8" JIC x 3/8" BSP .....	3
21	4-60-158	Adaptor, Long 7/8" JIC x 3/8" BSP .....	1
22	4-35-40K	Adaptor, Short 3/4" UNF x 3/8" BSP .....	2
23	4-60-115	Adaptor, Long 3/4" UNF x 3/8" BSP .....	2
24	T.14J	Adaptor 3/8" BSP x 3/8" BSP .....	1
25	4-35-388	Tee and Bracket .....	1
26	49S.1	"O" Ring .....	5
27	49S.2	"O" Ring .....	4
28	49S.11	"O" Ring .....	2
29	DSE 115	Adaptor 7/8" JIC x ½" BSP .....	1
30	100S.3	Seal 3/8" BSP .....	1
31	BSE 109	Elbow 3/4" BSP 90° .....	1
32	97S.7	Hose Clip 1" - 1.3/8" .....	2
33	10475.A01	Adaptor Plate .....	1
34	103S.3C	Capscrew 5/16" UNC x 1" Long .....	4
35	108S.1	Suction Strainer.....	1
36	10363.A01	Return Line Filter .....	1
37	10363.A02	Filter Element .....	1
38	72S.7	Back Nut 1½" BSP .....	1
39	100S.9	Seal 1½" BSP .....	2
40	111S.1A	Reducing Bush 1½" Male x ½" Female BSP .....	1



HYDRAULICS (Cont'd)

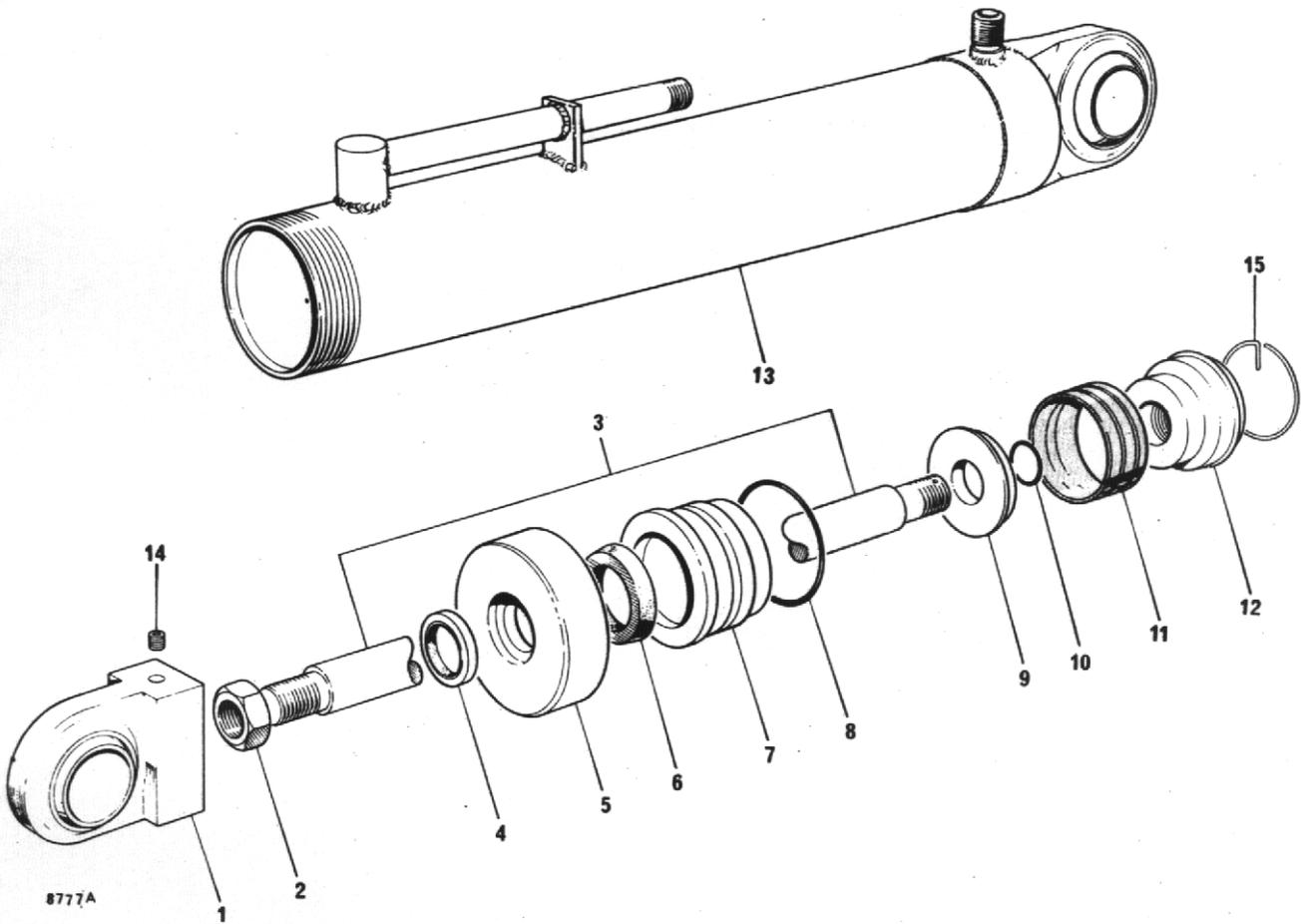
Item No.	Part No.	Description	Qty.
41	112S.1	Adaptor Male/Female $\frac{1}{2}$ " BSP .....	1
42	113S.1A	Unequal Male Tee $\frac{1}{2}$ " x $\frac{3}{8}$ " x $\frac{1}{2}$ " BSP .....	1
43	100S.4	Seal $\frac{1}{2}$ " BSP .....	1
44	40064.A01	Steering Wheel .....	1
45	10314.A01	Steering Wheel Cap .....	1
46	40074.A03	Hydraulic Tank including Mudwing .....	1
	177	Cable Tie (Not illustrated) .....	3
	10190.A01	Seal Kit (Hyd. Pump) .....	A/R

IT IS RECOMMENDED THAT DANFOSS OSPB STEERING UNITS ARE ONLY SERVICED IN DANFOSS AUTHORISED SERVICE SHOPS.

FOR U.K. – contact – Danfoss (London) Ltd., Perivale Industrial Estate, Horsenden Lane South, Greenford, Middlesex. Tel: 01 998 2041 Telex: 24223.

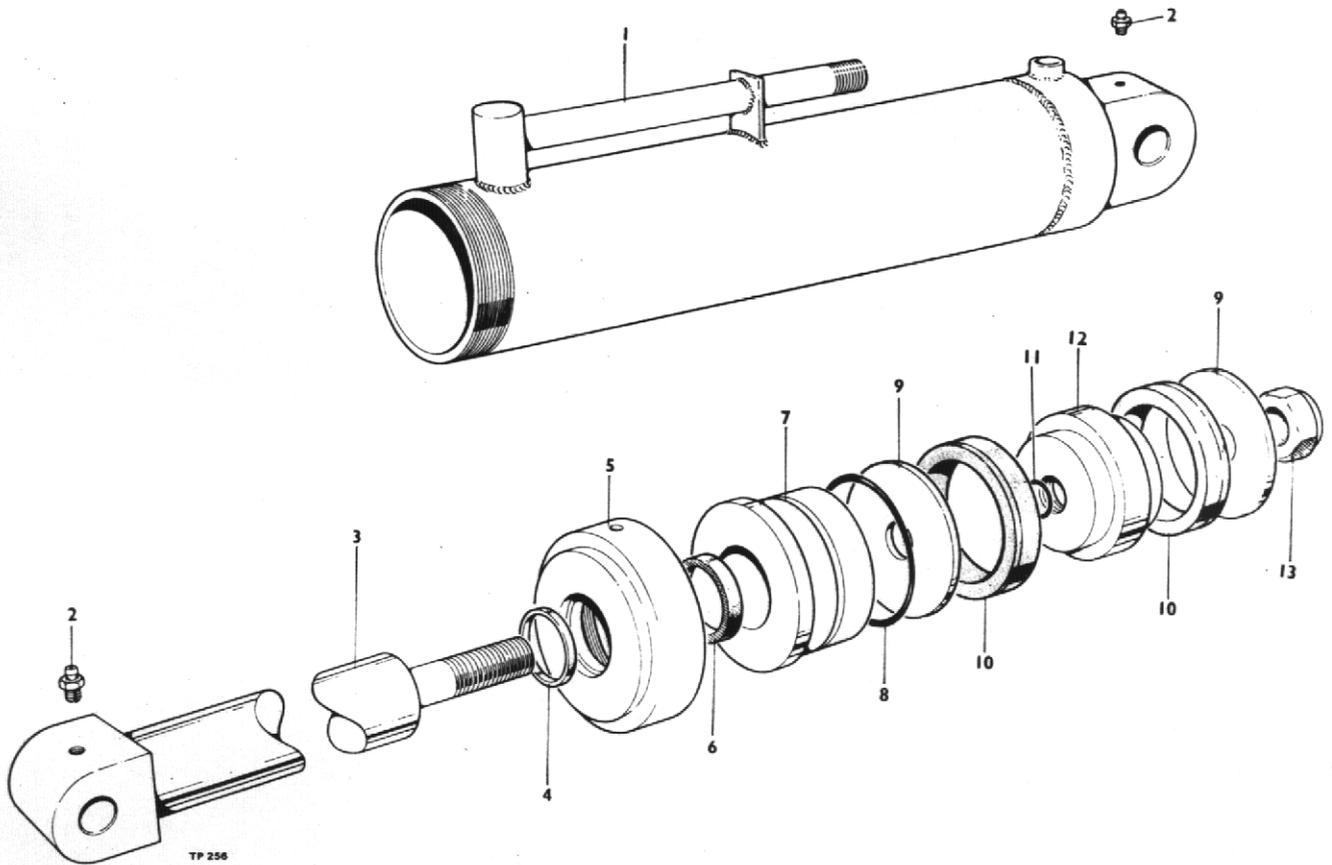
FOR EUROPEAN COUNTRIES. – contact – Department OG – SHT (Denmark) Telex:50599.

**HYDRAULIC RAM  
(FWD. TIP & ROTATING SKIP)**



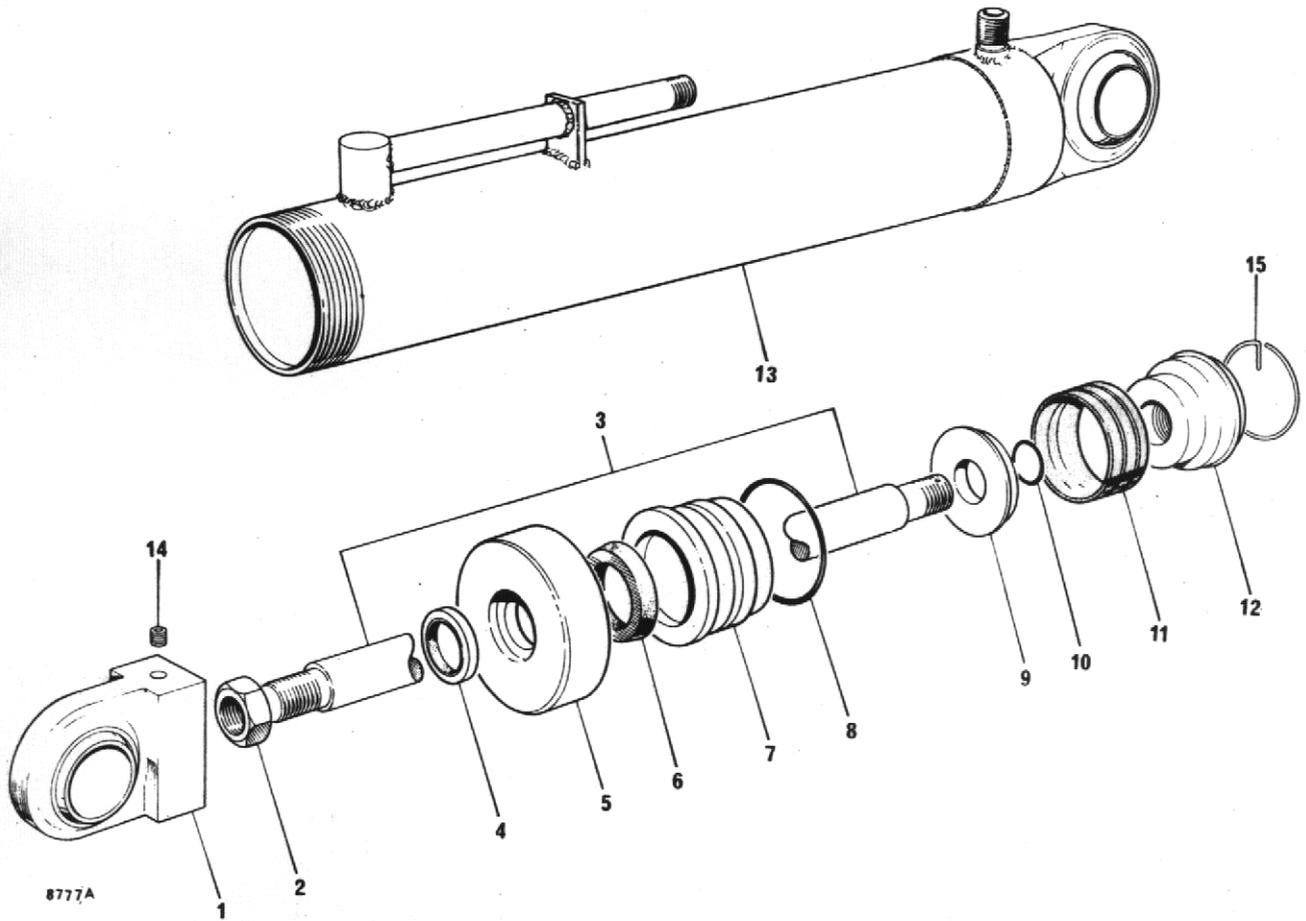
Item No.	Part No.	Description	Qty.
	30161.A01	Ram Complete (2 per M/c except High Discharge M/c's)	
1	30121.A0101	Piston Rod Fitting .....	1
2	30121.A0102	Locknut .....	1
3	30161.A0101	Piston Rod .....	1
4	30121.A0104	Wiper .....	1
5	30121.A0105	Tube Cap .....	1
6	30121.A0106	Sleeve Seal .....	1
7	30121.A0107	Sleeve .....	1
8	30121.A0108	Sleeve 'O' Ring .....	1
9	30121.A0109	Backing Washer .....	1
10	30121.A0110	Piston 'O' Ring .....	1
11	30121.A0111	Piston Seal .....	1
12	30121.A0112	Piston Head .....	1
13	30161.A0102	Cylinder, Bosses & End Cap .....	1
14	30121.A0114	Grub Screw .....	1
15	30121.A0115	Spring Ring .....	1
	CSE 189	Seal Kit (Comprising items 4,6,8,10 & 11) ..	A/R

## HYDRAULIC RAM (HIGH DISCHARGE SKIP)



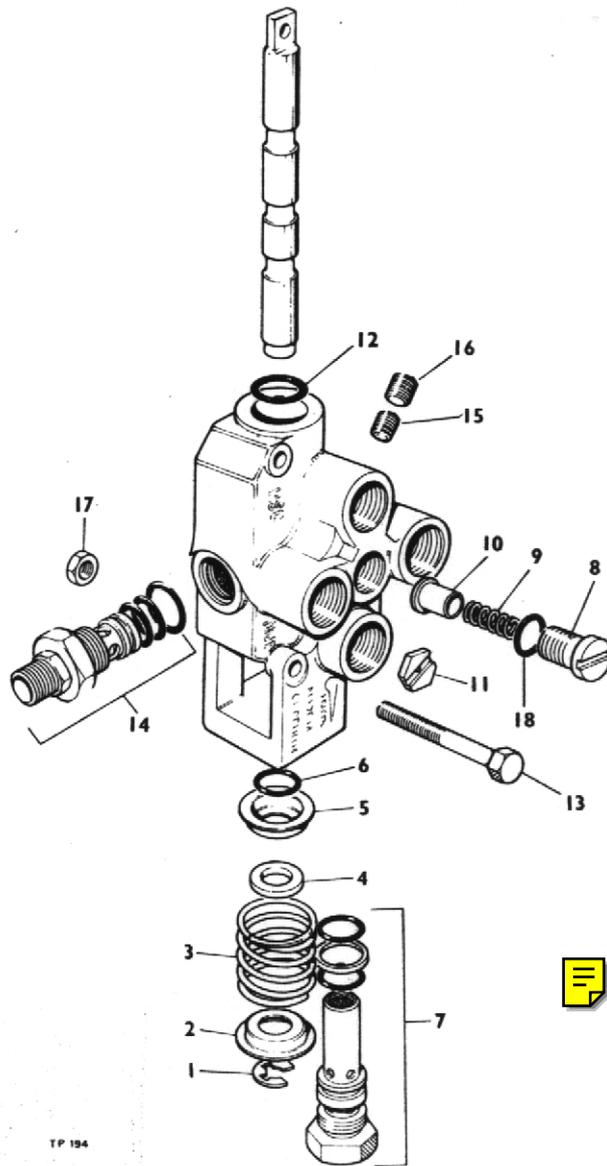
Item No.	Part No.	Description	Qty.
	30162.A01	Ram Assembly Complete (Two per high discharge m/c's only)	
1	30162.A0101	Ram Body .....	1
2	30162.A0102	Grease Nipple .....	2
3	30162.A0103	Piston Rod Assembly .....	1
4	30162.A0104	Wiper .....	1
5	30162.A0105	Tube Cap .....	1
6	30162.AC106	Sleeve Seal .....	1
7	30162.A0107	Sleeve .....	1
8	30162.A0108	Sleeve "O" Ring .....	1
9	30162.A0109	Backing Washer .....	2
10	30162.A0110	Piston Seal .....	2
11	30162.A0111	Piston "O" Ring .....	1
12	30162.A0112	Piston Head .....	1
13	30162.A0113	Lock Nut .....	1
	CSE 190	Seal Kit (comprising items 4,6,8,10 & 11) .....	A/R

## HYDRAULIC RAM (STEERING)



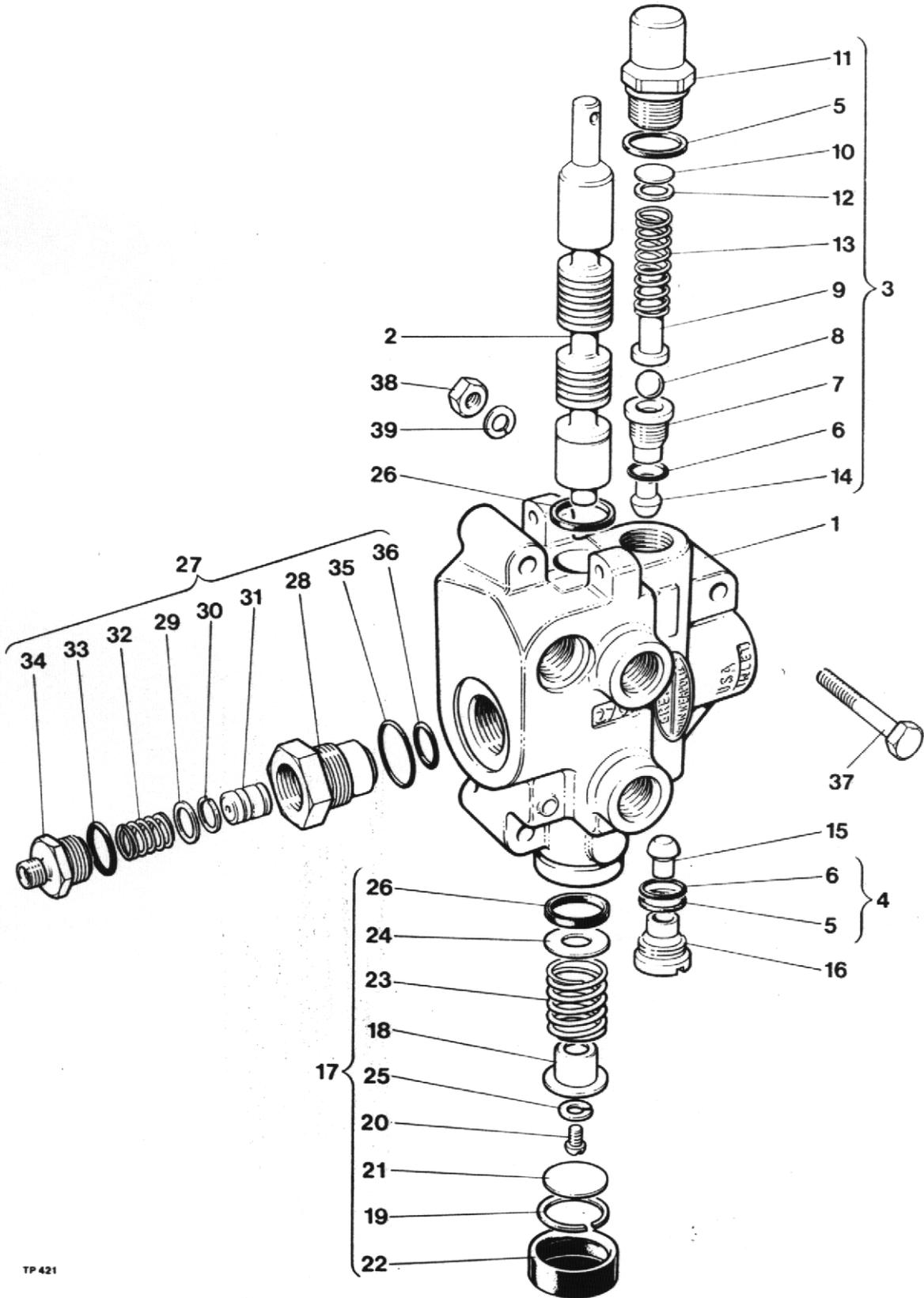
Item No.	Part No.	Description	Qty.
	30121.A01	Ram Complete (1 per Machine)	
1	30121.A0101	Piston Road Fitting .....	1
2	30121.A0102	Locknut .....	1
3	30121.A0103	Piston Rod .....	1
4	30121.A0104	Wiper .....	1
5	30121.A0105	Tube Cap .....	1
6	30121.A0106	Sleeve Seal .....	1
7	30121.A0107	Sleeve .....	1
8	30121.A0108	Sleeve 'O' Ring .....	1
9	30121.A0109	Backing Washer .....	1
10	30121.A0110	Piston 'O' Ring .....	1
11	30121.A0111	Piston Seal .....	1
12	30121.A0112	Piston Head .....	1
13	30121.A0113	Cylinder, Bosses & End Cap .....	1
14	30121.A0114	Grub Screw .....	1
15	30121.A0115	Spring Ring .....	1
	CSE 189	Seal Kit (comprising items 4,6,8,10 & 11) ..	A/R

# HYDRAULIC CONTROL VALVE



TP 194

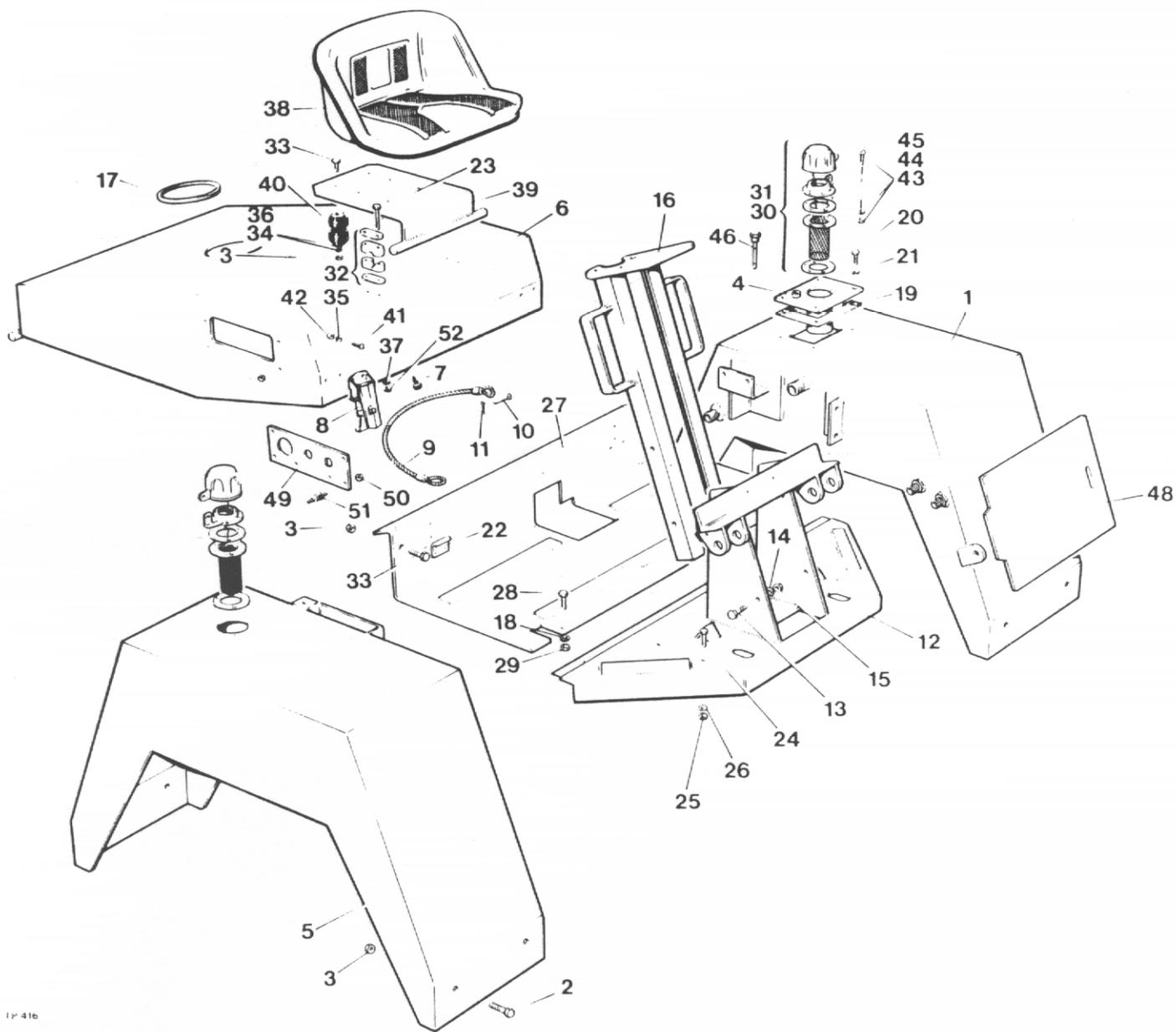
Item No.	Pt. No.	Description	Qty.
	30131.A01	Control Valve Assembly (1 per machine) .....	1
1	30131.A0101	Clip Ring (½" Shaft) .....	1
2	30131.A0102	Shallow Washer .....	1
3	30131.A0103	Spool Spring .....	1
4	30131.A0104	Washer Spacer .....	1
5	30131.A0105	Deep Washer .....	1
6	30131.A0106	"O" Ring 3/32" x 5/8" I.D. ....	1
7	30131.A0107	Relief Valve Assembly .....	1
8	30131.A0108	Lift Check Plug Assembly .....	1
9	30131.A0109	Lift Check Spring .....	1
10	30131.A0110	Lift Check Plunger .....	1
11	30131.A0111	Orifice Plate .....	1
12	30131.A0112	"O" Ring .....	1
13	6S.3H	Bolt 5/16" UNF x 2½" Long .....	2
14	30131.A0113	Flow Control Valve .....	1
15	30131.A0116	Plug 1/16" .....	1
16	30131.A0117	Plug 1/8" .....	1
17	9S.2	Nut 5/16" UNF .....	2
18	30131.A0118	"O" Ring .....	1
19	30131.A0114	Seal Repair Kit (Relief Valve) .....	A/R
20	30131.A0115	Seal Repair Kit .....	A/R



## HYDRAULIC CONTROL VALVE

Item No.	Part No.	Description	Qty.
	30180.A01	Control Valve (Complete) .....	1
1		Housing .....	1
2		Spool - 4 Way - 3 Position } Not supplied as spares-	1
3	30180.A0101	Relief Valve Assembly (comp. items 5-14 inc.) ...	1
4	30180.A0102	Seal Kit (comp. items 5 & 6) .....	A/R
5		Gasket - Relief Body .....	2
6		"O" Ring - Relief Valve Seat } Order 30180.A0102	2
7	30180.A0112	Seat - Relief Valve .....	1
8	30180.A0138	Ball .....	1
9	30180.A0105	Guide - Spring .....	1
10	30180.A0106	Shim .....	A/R
11	30180.A0107	Body .....	1
12	30180.A0108	Washer - Spacer .....	1
13	30180.A0109	Spring .....	1
14	30180.A0110	Poppet - Check .....	1
	30180.A0111	Plug Assembly (comp. Items 5,6,15&16 ).....	1
15	30180.A0110	Poppet .....	1
16	30180.A0114	Guide - Poppet .....	1
17	30180.A0115	Positioner Assembly - Spring Return to Neutral (comp. items 18-26 inc.)...	1
18	30180.A0116	Collar - Stop .....	1
19	30180.A0117	Ring - Retaining .....	1
20	30180.A0118	Screw .....	1
21	30180.A0119	Disc - Stop .....	1
22	30180.A0120	Bonnet - Rubber .....	1
23	30180.A0121	Spring - Centring, Standard .....	1
24	30180.A0122	Washer - Stop .....	1
25	30180.A0123	Lockwasher .....	1
26	30180.A0124	Seal .....	2
27	30180.A0125	Flow Control Valve Assy. (comp. items 28-36 inc.)	1
28	30180.A0126	Sleeve .....	1
29	30180.A0127	Washer .....	1
30	30180.A0128	Ring - Retaining .....	1
31	30180.A0129	Piston .....	1
32	30180.A0130	Spring .....	1
33	30180.A0131	Seal - "O" Ring .....	1
34	30180.A0132	Union .....	1
35	30180.A0133	Seal "O" Ring .....	1
36	30180.A0134	Seal "O" Ring .....	1
37	8S.4R	Bolt - Hex. Hd. M10 x 120 Long .....	3
38	7S.4	Nut M10 .....	3
39	17S.5	Washer - Spring M10 .....	3

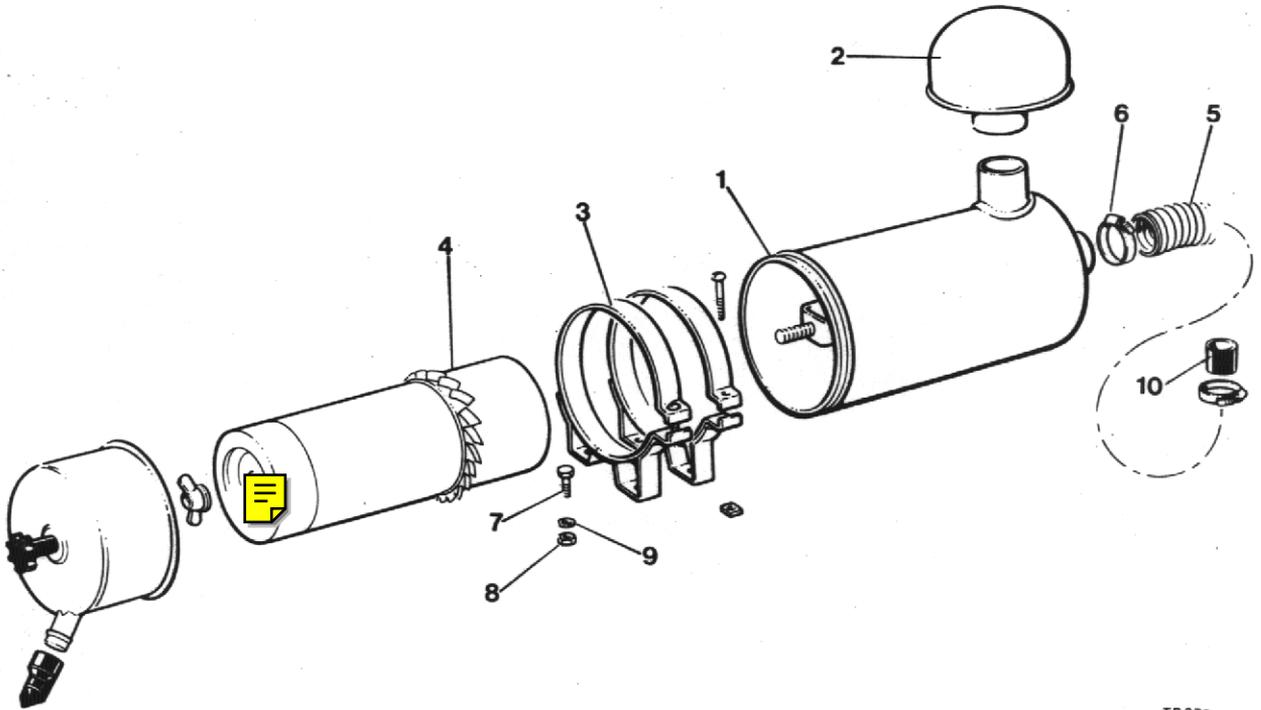




## MUDWINGS AND COVERS

Item No.	Part No.	Description	Qty.
1	40074.A03	L.H. Mudwing & Hydraulic Tank .....	1
2	11S.4C	Setscrew Hex Hd. M10 x 25 Long .....	10
3	61S.4	Selflock Nuts M10 .....	10
4	20098.A03	Tank Filler .....	1
5	40073.A03	Mounting Plate .....	1
6	40094.A05	R.H. Mudwing & Fuel Tank .....	1
	40112.A03	Engine Cover ..... (Non Electric Start M/c's) ....	1
7	10554.A01	Engine Cover ..... (Electric Start M/c's).....	1
8	10537.A02	Rubber Buffers .....	4
9	10366.A03	Toggle Fasteners .....	2
10	10650.A19	Engine Cover Strap .....	1
11	44S.2A	Clevis Pin .....	1
12	40080.A01	Split Pin 3/32" x 1" Long .....	1
13	11S.3C	Foot Pedal Bracket .....	1
14	17S.4	Setscrew Hex. Hd. M8 x 25 Long .....	4
15	7S.3	Spring Washer M8 .....	4
16	30125.A01	Nut Hex. Hd. M8 .....	4
17	10566.A01	Steering Column .....	1
18	12S.3	Rubber Grommet .....	1
19	5ST.18B	Washer 8 mm dia .....	2
20	11S.3B	Gasket .....	1
21	17S.4	Setscrew Hex. Hd. M8 x 20 Long .....	4
22	10538.A02	Spring Washer M8 .....	4
23	8S.2F	Catch Plate .....	2
24	11S.4D	Bolt Hex. Hd. M6 x 50 Long .....	4
25	7S.4	Setscrew Hex. Hd. M10 x 30 Long .....	4
26	17S.5	Nut M10 .....	4
27	40121.A01	Spring Washer M10 .....	4
28	11S.3B	Floor Panel .....	1
29	61S.3	Setscrew Hex. Hd. M8 x 20 Long .....	2
30	10565.A01	Nut Selflocking M8 .....	2
31	10565.A02	Filler Cap .....	2
32	10364.A01	Breather Filler Cap (Alternative) .....	2
33	64S.4C	Pivot Block .....	2
34	12S.5	Bolt Hex. Hd. M10 x 20 Long .....	4
35	12S.1	Washer M10 .....	4
36	C180B	Washer 5mm .....	8
37	12S.2	Washer 3/8" .....	2
38	4-35-301	Washer M6 .....	4
39	30148.A01	Seat c/w Bolts & Washers .....	1
40	10519.A01	Seat Frame .....	1
41	82S.3C	Rubber Spring .....	2
42	85S.1	Screw Rd. Hd. Slotted 2BA x 1/2" Long .....	8
43	82S.3E	Selflocking Nut 2BA .....	8
44	85S.1	Round Hd. Screw 2BA x 3/4" Long .....	6
45	12S.1	Selflocking Nut 2BA .....	6
46	10632.A01	Plain Washer M5 .....	6
47	10565.A0101	Dipstick .....	1
48	20139.A01	Sealing Washer-(Use with Filler Cap Ass.10565.A01	2
49	10447.A02	Cover Plate - Battery (when fitted) .....	1
50	61S.9	Instrument Panel (when fitted).....	1
51	10371.A02	Nut M4 'Binx' ... (when fitted).....	8
52	61S.2	Flexible Mounting (when fitted).....	4
		Selflock Nut M6 .....	4

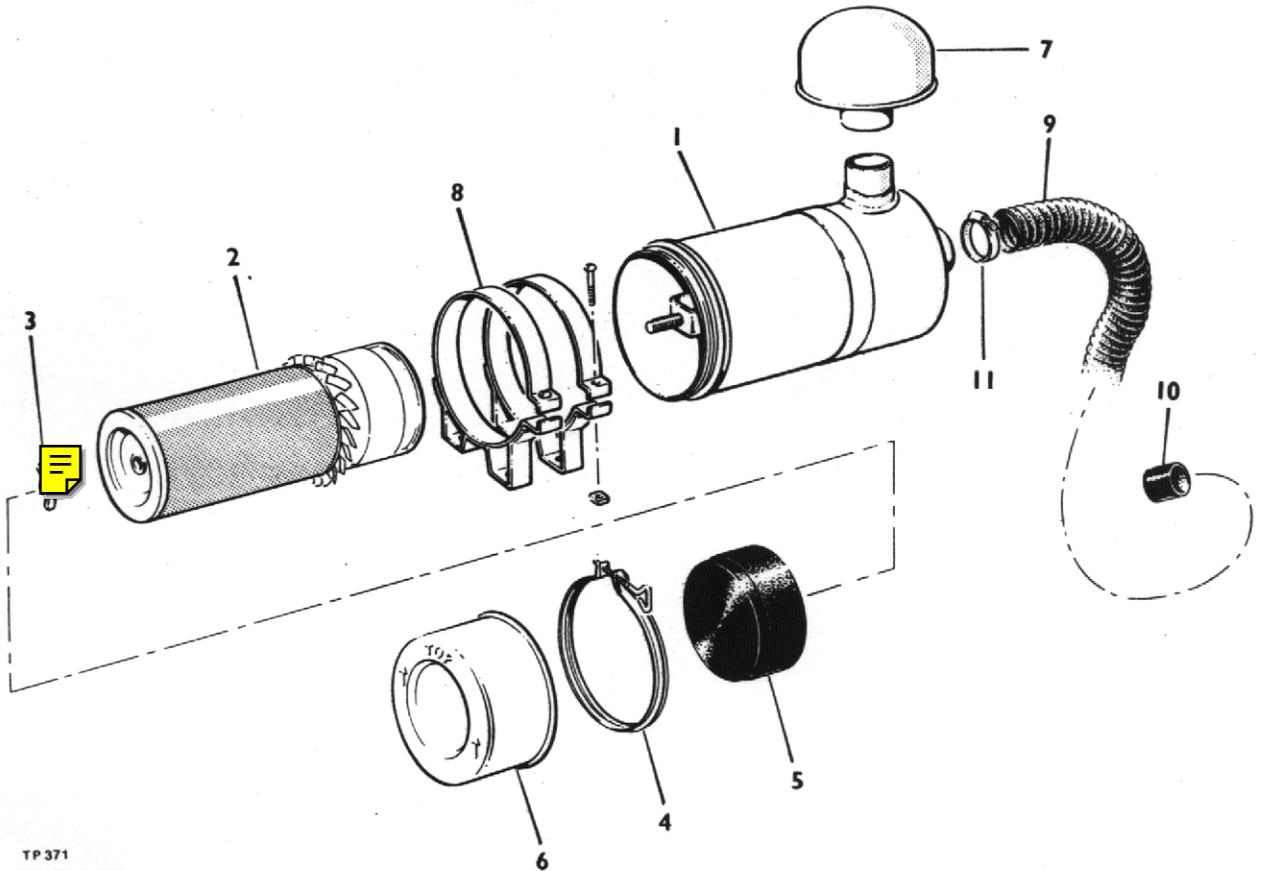
# AIR CLEANER



TP372

Item No.	Part No.	Description	Qty.
1	10532.A01	Air Cleaner Assembly  omplete .....	1
2	10534.A01	Stack Cap .....	1
3	10533.A01	Mounting Bands .....	2
4	10532.A0101	Element Assembly .....	1
5	10319.A02	Hose (Petter)  .....	1
	10319.A03	Hose (Lister) .....	1
6	97S.15	Hose Clip (Petter) .....	1
	97S.12	Hose Clip (Lister) .....	1
7	8S.3A	Setscrew Hex. Hd. M8 x 25 Long .....	4
8	61S.3	Nut M8 .....	4
9	12S.3	Washer M8 .....	4
10	10320.A01	Pipe Adaptor .....	1

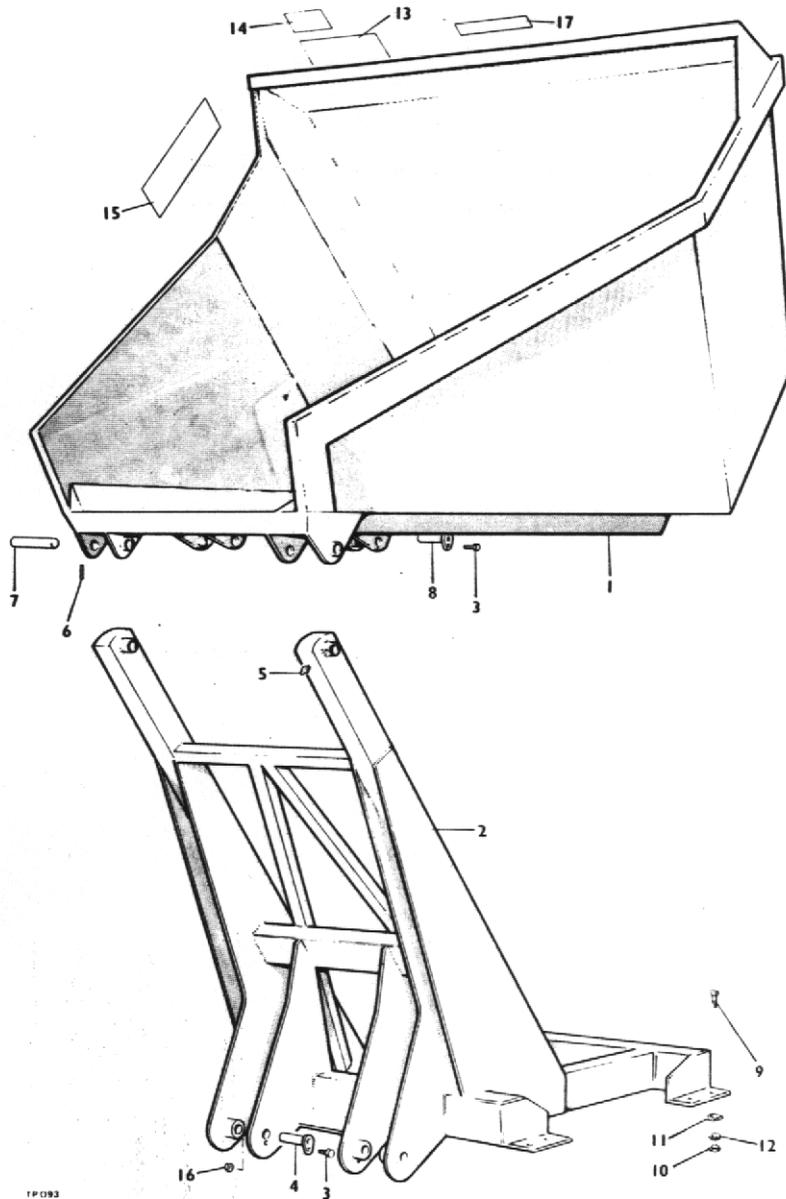
# AIR CLEANER



TP 371

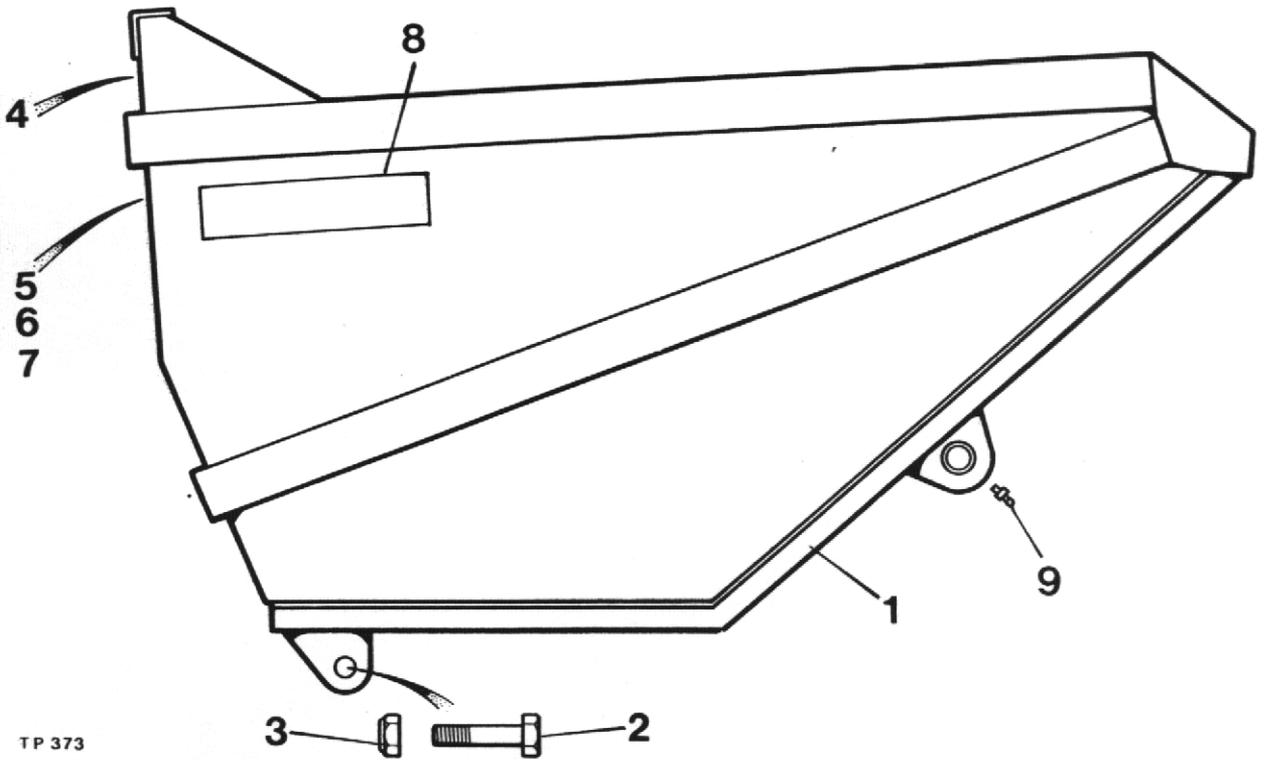
Item No.	Part No.	Description	Qty.
	10532.A02	Air Cleaner complete (Items 1-6)	1
1	10532.A0201	Body Assembly	1
2	10532.A0101	Element Assembly	1
3	10532.A0202	Nut and Gasket	1
4	10532.A0203	Clamp Assembly	1
5	10532.A0204	Skirt, Baffle	1
6	10532.A0205	Cup Assembly	1
7	10534.A02	Stick Cap	1
8	10533.A02	Mounting Bracket	2
9	10319.A02	Hose (Petter)	1
	10319.A03	Hose (Lister)	1
10	10320.A01	Pipe Adaptor	1
11	97S.15	Hose Clip (Petter)	1
	97S.12	Hose Clip (Lister)	1

# HIGH DISCHARGE SKIP AND FRAME



Item No.	Part No.	Description	Qty.
1	4-35-210	Skip .....	1
2	4-35-323	Frame .....	1
3	8S.3A	Bolt M8 x 25mm Long .....	4
4	4-35-226	Lower Ram Pin .....	2
5	5ST 100	Grease Nipple .....	2
6	4-35-29A	Tension Pin 5/16" dia. x 2 1/2" Long .....	2
7	5ST 84	Skip Pivot Pin .....	2
8	4-35-178	Ram Pin .....	2
9	8S.5E	Bolt Hex.Hd. M12 x 45 Long .....	8
10	7S.6	Locknut M12 .....	8
11	105S.5	Taper Washer M12.....	8
12	12S.6	Plain Washer M12 .....	8
13	20132.A01	Label "Dumper Safety" .....	1
14	DM 157	Label "Unropped Skip" .....	1
15	DM 154	Label "Winget" .....	1
16	7S.3	Nut M8 .....	4
17	10541.A01	Label "Payload" .....	1

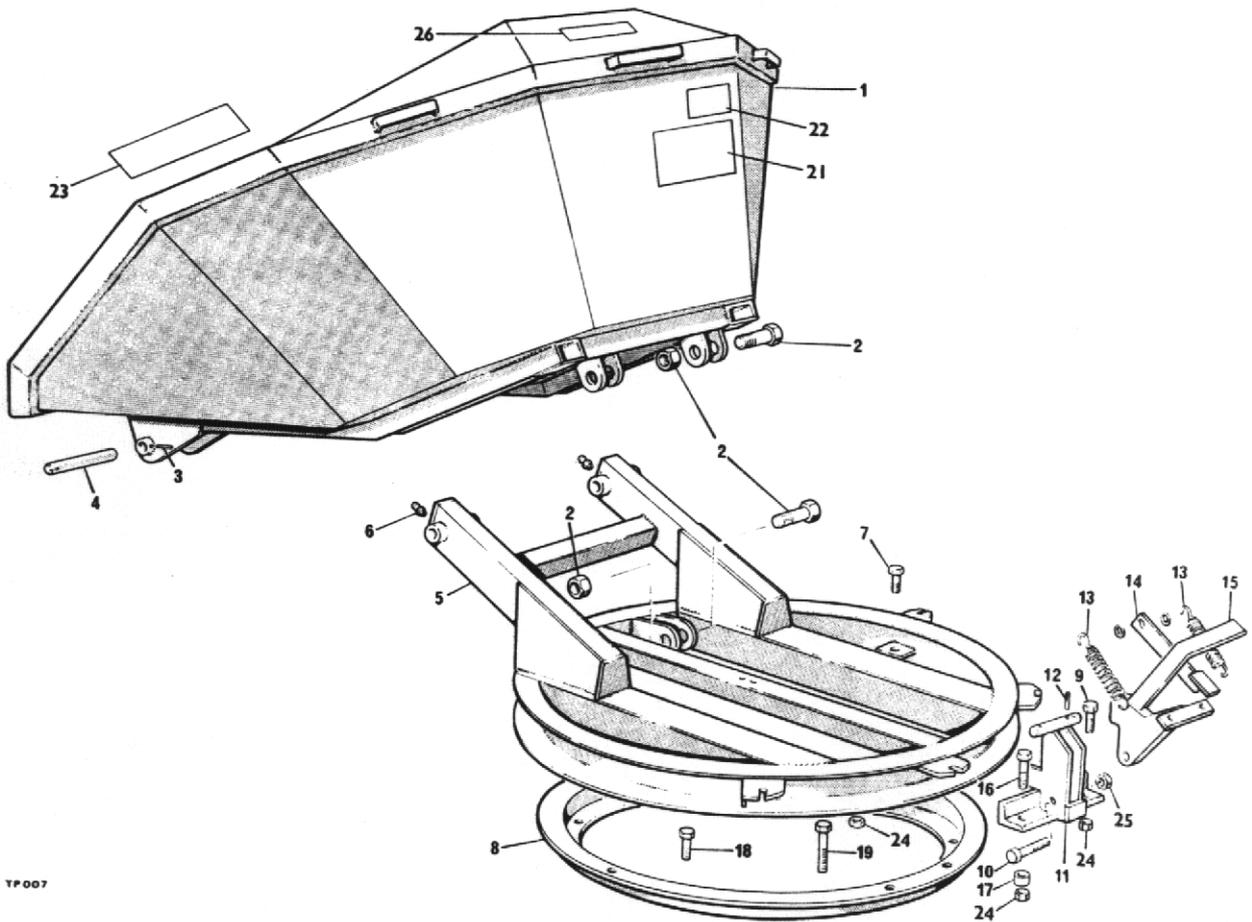
# FORWARD TIP SKIP



Item No.	Part No.	Description	Qty.
1	40088.A03	Skip .....	1
2	435110A	Skip Ram Bolts KIT 435110 .....	2
3	435110B	Skip Ram Nuts .....	2
4	10541.A01	Label - "Payload" .....	1
5	20132.A01	Label - "Dumper Safety & Instruction" .....	1
6	DM 196	Label - "Lubrication" (Newage Axle) .....	1
7	10213.A01	Label - "Lubrication" (Hamworthy Axle).....	1
8	DM 154	Label "Winget" .....	2
9	131S.3	Grease Nipple .....	2

Note: Separate skip panels can be supplied - Details on application.

## ROTATING SKIP & FRAME

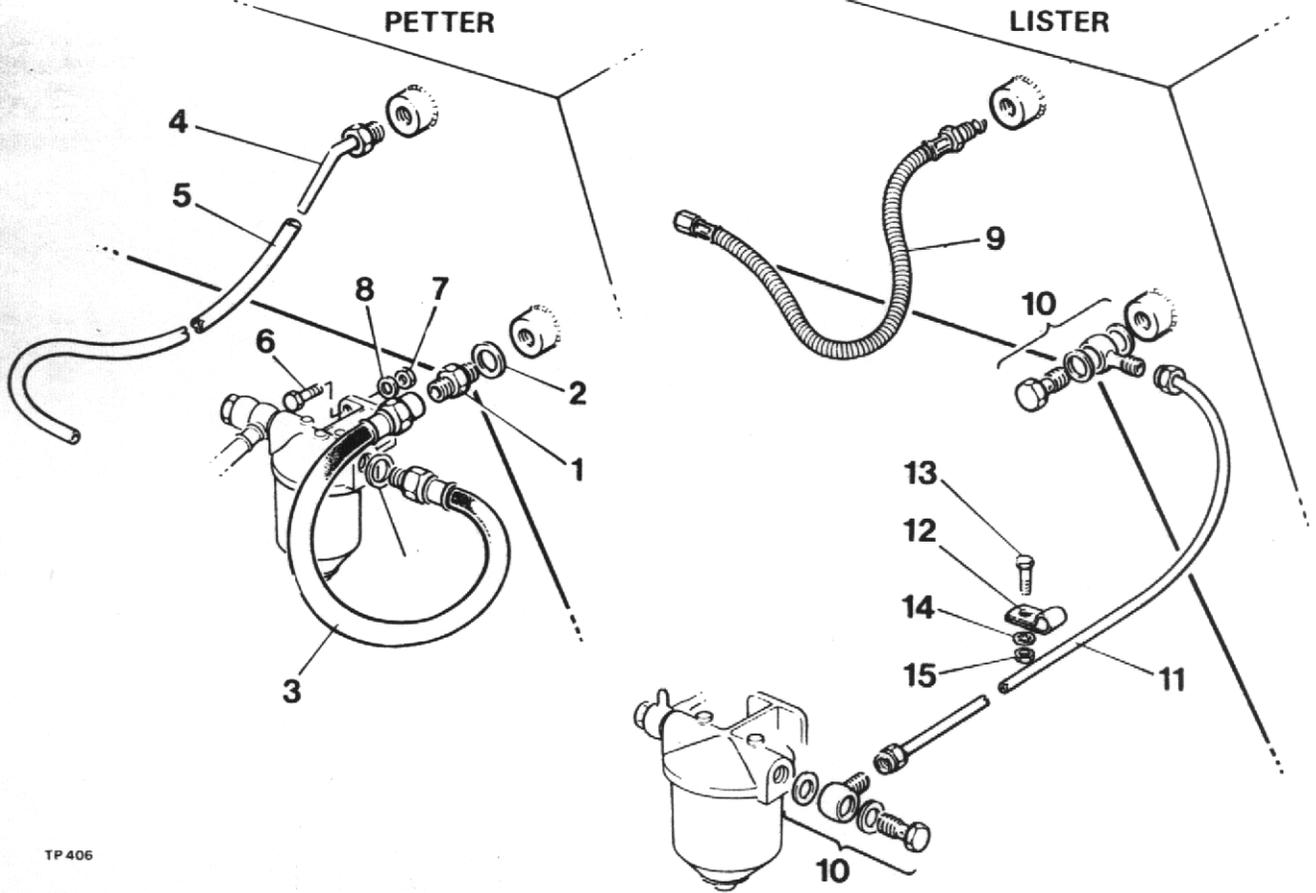


TF007

Item No.	Part No.	Description	Qty
1	5ST 79	Narrow Mouth Skip .....	1
	5ST 97	Wide Mouth Skip .....	1
2	4-35-110	Ram Bolt & Nut .....	4
3	4-35-29A	Tension Pin 5/16" x 2 1/2" Long .....	2
4	5ST 84	Skip Pivot Pin .....	2
5	5ST 78	Turntable .....	1
6	5ST 100	Grease Nipple .....	2
7	8S.5C	Bolt M12 x 35mm Long .....	4
8	5ST 69	Turntable Ring .....	1
9	8S.5D	Bolt M12 x 40mm Long .....	1
10	8S.6G	Bolt M16 x 55mm Long .....	1
11	4-35-319-12	Turntable Catch Body .....	1
12	C129A	Tension Pin 3/16" dia. x 1 1/2" Long .....	1
13	4-35-320	Spring .....	2
14	4-35-319-4	Locking Bar .....	1
15	4-35-319-13	Catch Plate .....	1
16	8S.5G	Bolt M12 x 55mm Long.....	1
17	4-35-327	Packing Piece 7/8" dia. 1/2" Bore x 5/8" Long.	1
18	8S.5E	Bolt M12 x 45mm Long.....	4
19	8S.5Q	Bolt M12 x 110mm Long .....	4
20	4-35-319	Turntable Catch Assembly (Complete) .....	1
21	20132.A01	Label "Dumper Safety".....	1
22	DM 157	Label "Unpropped Skip" .....	1
23	DM 154	Label "Winget" .....	1
24	7S.5	Nut M12 .....	14
25	7S.6	Nut M16 .....	1
26	10541.A01	Label "Payload" .....	1

Note: Separate skip panels can be supplied - Details on application.

# FUEL SYSTEM

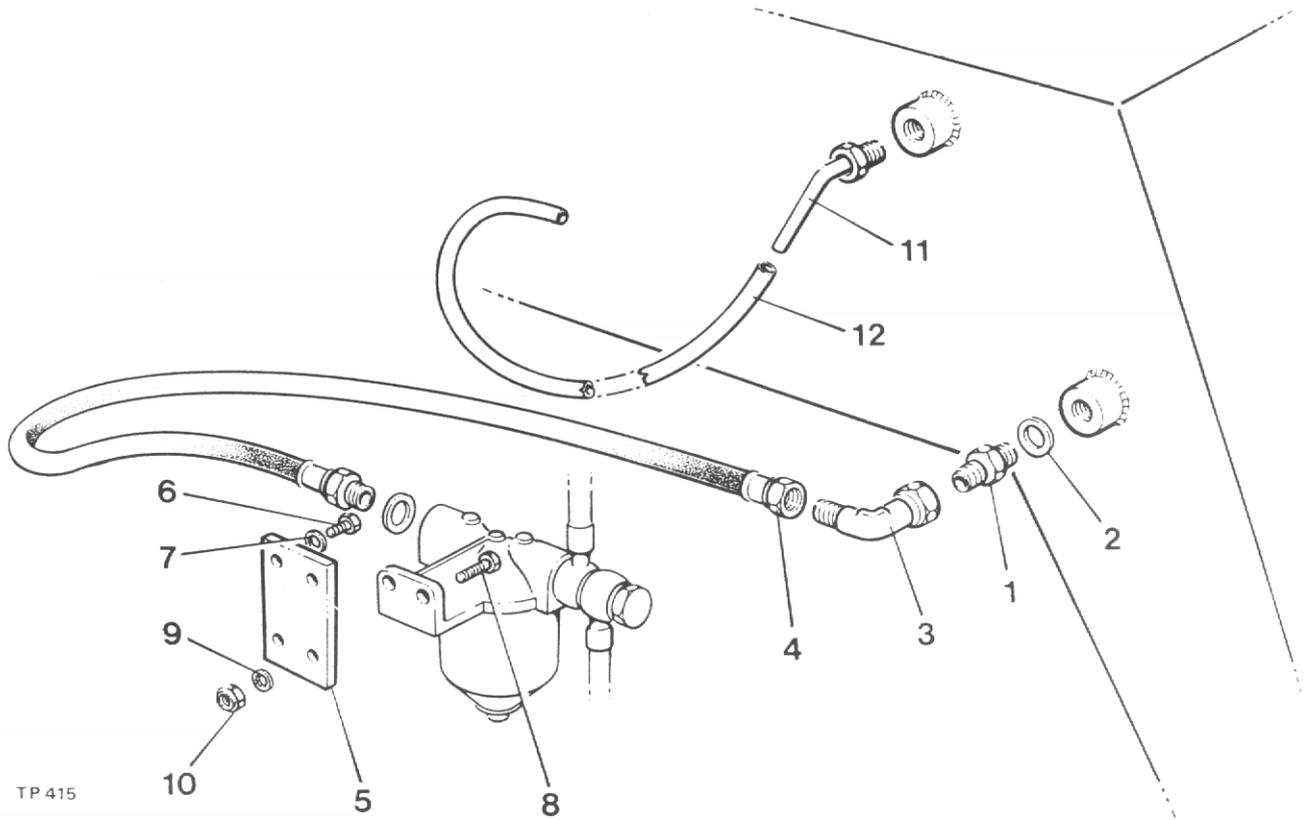


TP 406

Item No.	Part No.	Description	Qty.
1	4-60-189	* Stud Coupling - Flexible Pipe to Tank.....	1
2	4-35-364	* Washer - Flexible Pipe to Tank .....	1
3	10605.A01	* Flexible Pipe - Tank to Filter .....	1
4	10576.A01	* Union - Bleed off Tube to Tank .....	1
5	29S.8	* Bleed off Tube 30" Long.....	1
6	11S.2B	* Setscrew Hex. Hd. M6 x 20 Lg., Filter to Tank ..	2
7	72S.2	* Nut M6 - Filter to Tank .....	2
8	12S.2	* Washer - Plain M6 dia., Filter to Tank .....	2
9	10357.A04	+ Leak Back Flexible Pipe .....	1
10	117S.2	+ Banjo Coupling Assembly .....	2
11	29S.5	+ Pipe - Tank to Filter .....	1
12	10350.A01	+ Pipe Clip.....	1
13	64S.3	+ Setscrew Hex. Hd. M6 x 25 Lg.....	1
14	13S.2	+ Washer - Shakeproof M6 .....	1
15	65S.2	+ Nut Hex M6 .....	1

\* Petter Engines  
+ Lister Engines

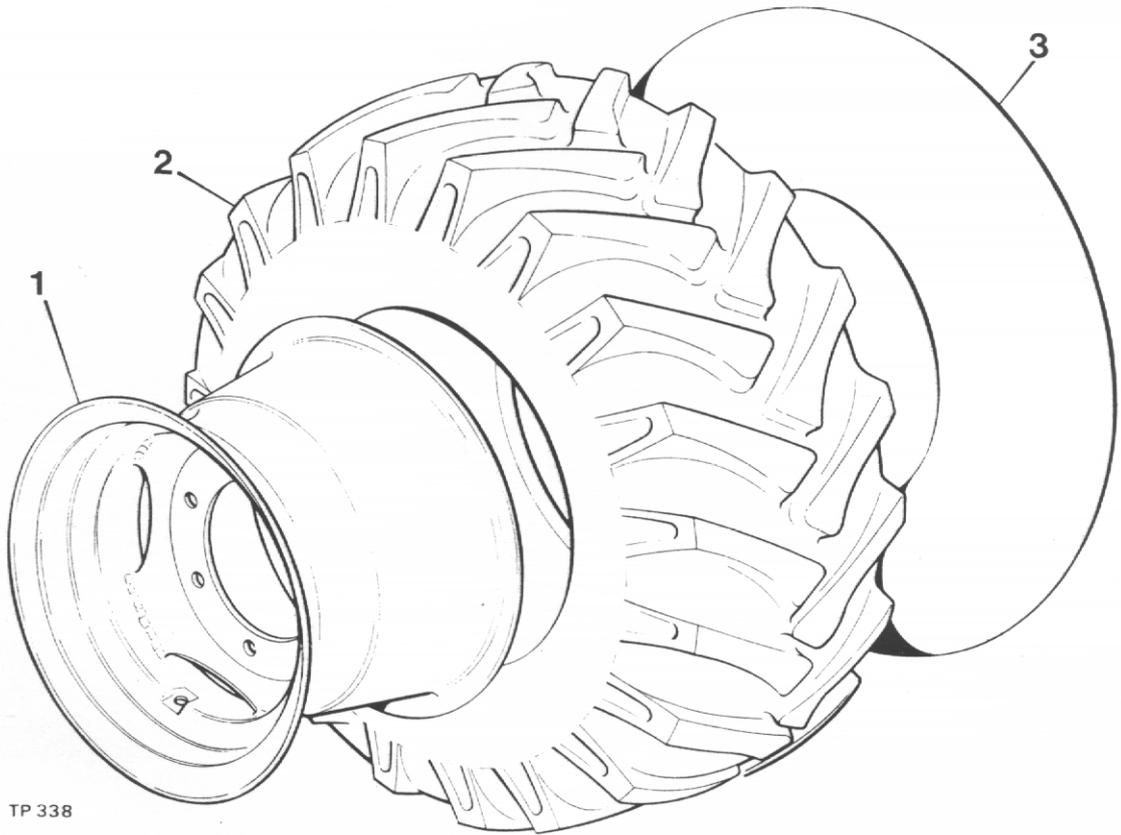
# FUEL SYSTEM



TP 415

Item No.	Part No.	Description	Qty.
1	4-60-189	Stud Coupling .....	1
2	4-35-364	Washer .....	1
3	123S.2	Elbow .....	1
4	10605.A01	Flexible Hose - Elbow to Filter (Petter) .....	1
5	10628.A01	Bracket - Filter Mounting .....	1
6	3S.1D	Setscrew Hex. Hd. $\frac{1}{2}$ " BSF x $\frac{3}{2}$ " Long .....	2
7	67S.1	Washer - Shakeproof $\frac{1}{2}$ " .....	2
8	11S.2B	Setscrew Hex. Hd. M6 x 20 Long .....	2
9	13S.2	Washer - Shakeproof M6 .....	4
10	65S.2	Nut Hex. M6 .....	2
11	10576.A01	Tank Bleed Back Pipe .....	1
12	29S.8	Bleed Back Tube .....	1

## WHEELS AND TYRES

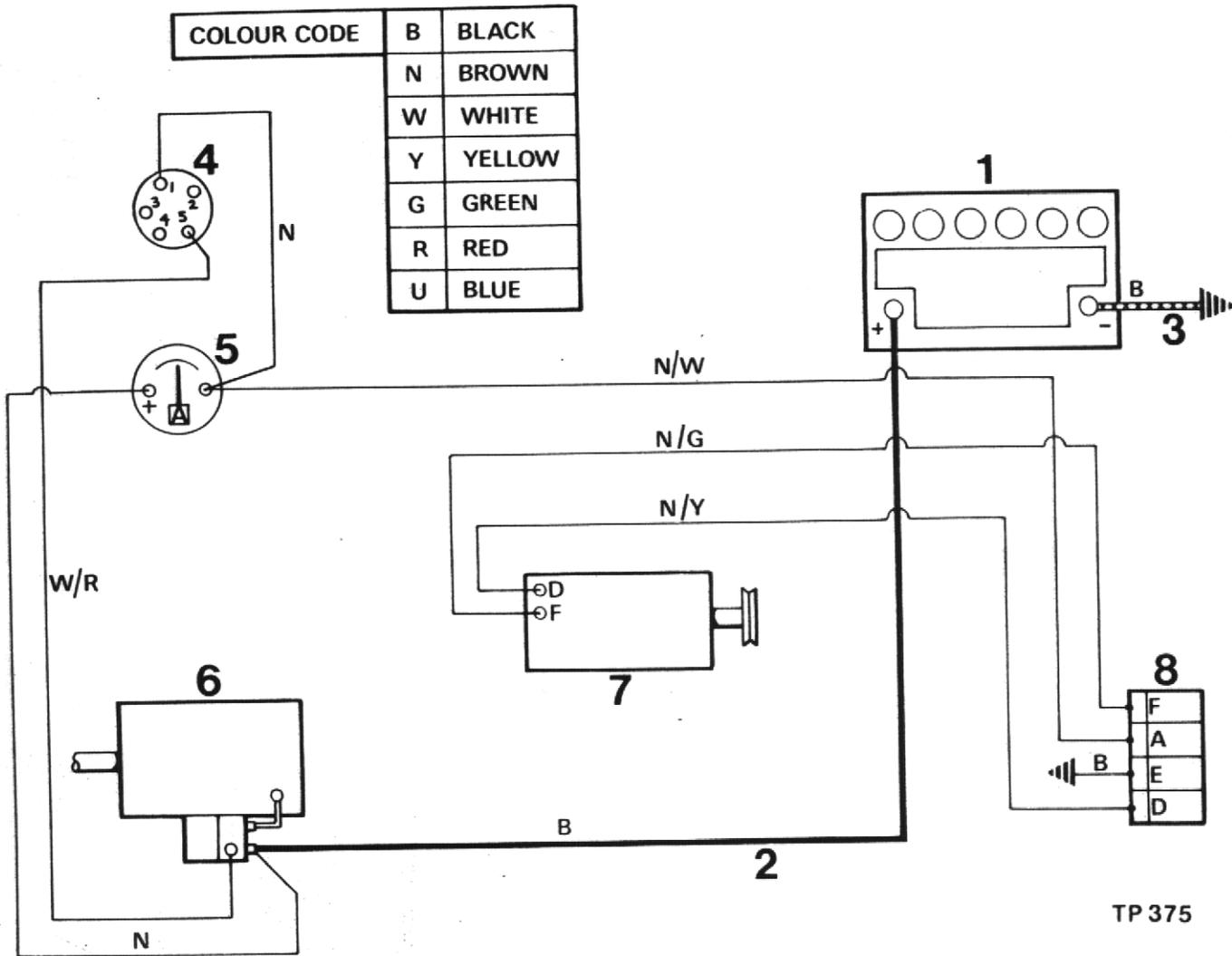


TP 338

Item No.	Part No.	Description	Qty.
	24S.11	Wheel Assembly L.H. Comp Items 1,2, & 3. ....	2
	24S.12	Wheel Assembly R.H. Comp Items 1,2, & 3. ....	2
1	30183.A02	Wheel .....	4
2	20S.02	Tyre 10.5 x 18 x 8 Ply .....	4
3	23S.04	Tube .....	4
	10668.A02	Wheel Nut (Not illustrated) .....	24

# WIRING DIAGRAM (ELECTRICAL SYSTEM)

(LISTER)

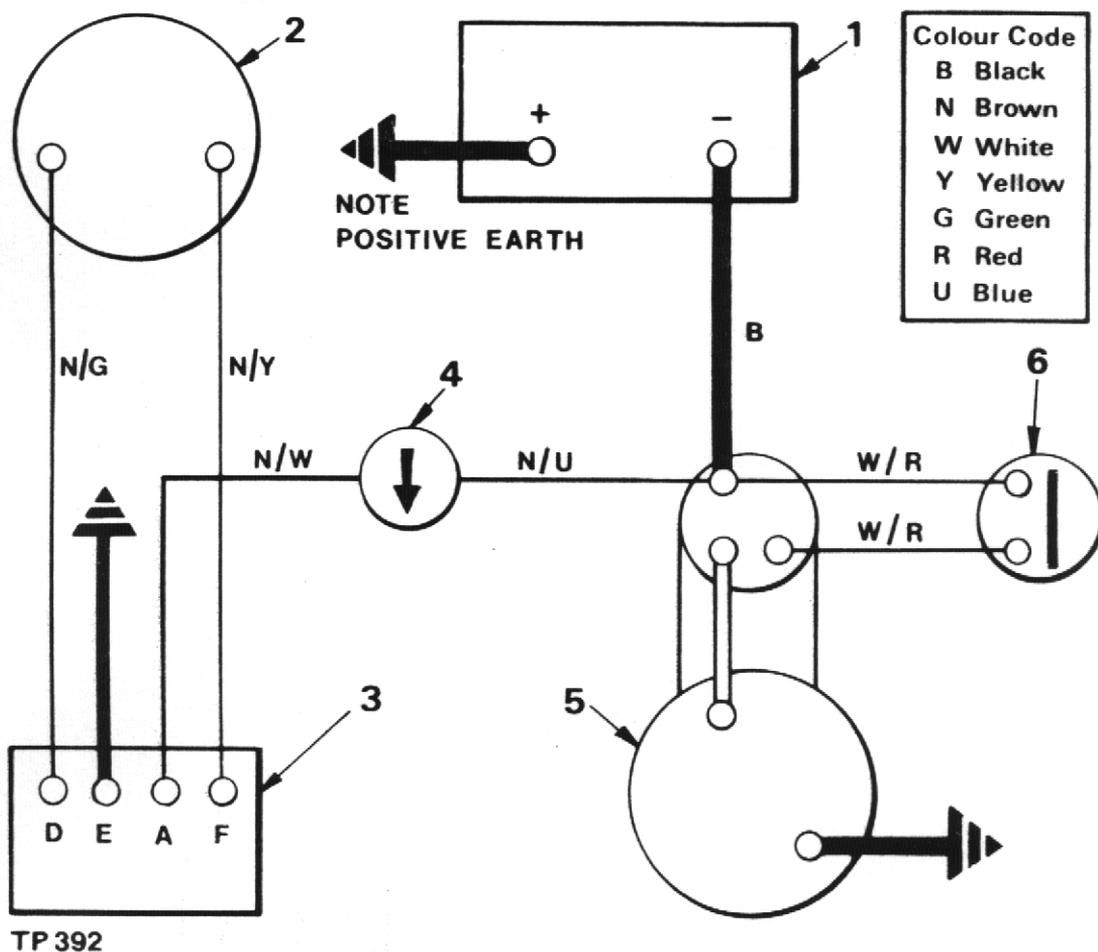


TP 375

Item No.	Part No.	Description	Qty.
1	109S.1	Battery .....	1
	109S.3	Battery (Alternative) .....	1
2	10227.A01	Positive Cable c/w End Fittings .....	1
3	10228.A01	Negative Cable c/w End Fittings .....	1
4	10614.A02	Switch c/w Keys .....	1
5	10612.A02	Ammeter .....	1
6	10613.A02	Starter Motor & Solenoid .....	1
7	10610.A02	Generator .....	1
8	10611.A02	Regulator .....	1
9	20105.A01	Wiring Harness Complete (Not Illustrated) .....	1
10	FSE 448	Adhesive Clip (Large) (Not Illustrated) .....	A/R
11	FSE 449	Adhesive Clip (Small) (Not Illustrated) .....	A/R

# WIRING DIAGRAM (ELECTRICAL SYSTEM)

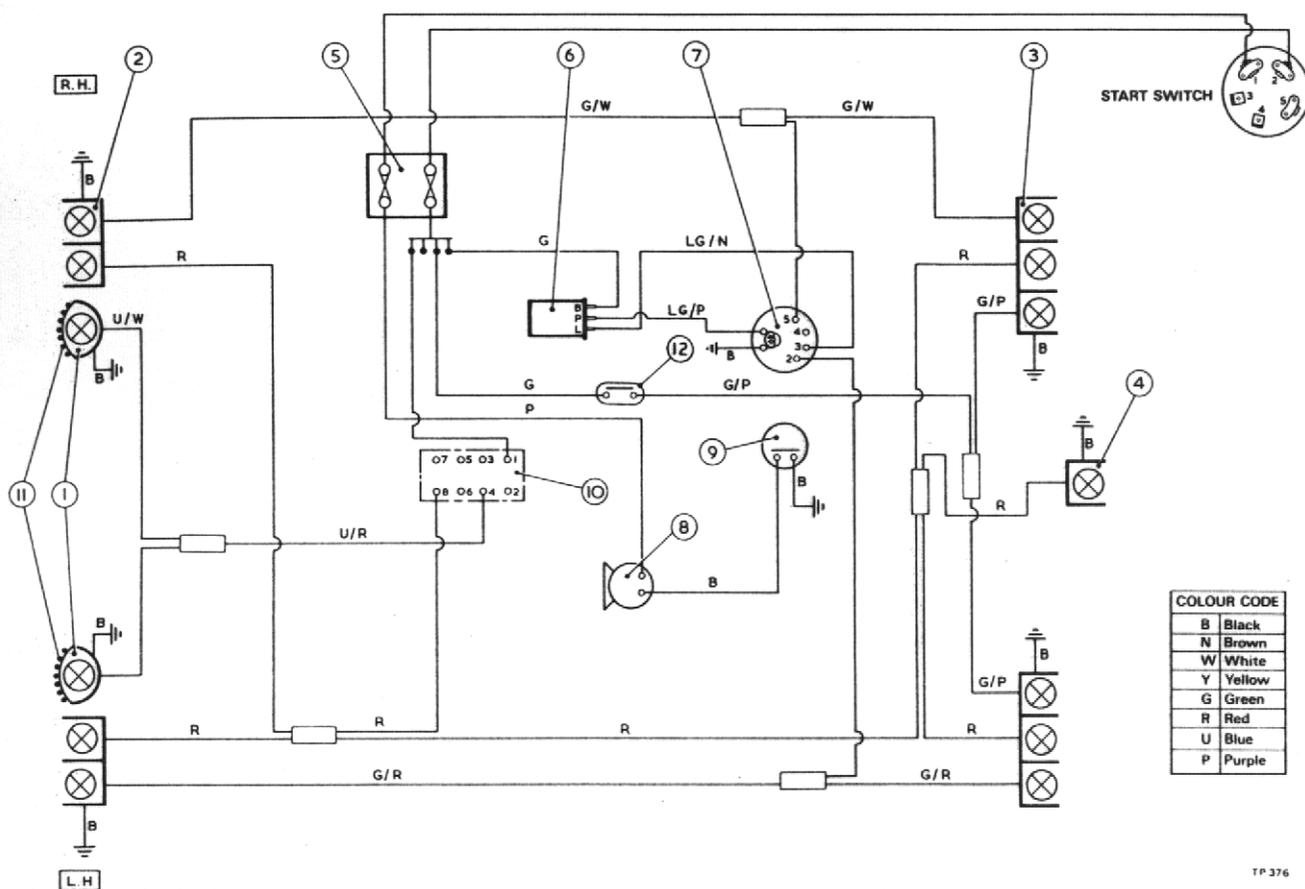
PETTER



Item No.	Part No.	Description	Qty.
	109S.1	Battery .....	1
1	109S.3	Battery (Alternative) .....	1
2	10610.A01	Dynamo .....	1
3	10611.A02	Regulator .....	1
4	10612.A02	Ammeter .....	1
5	10613.A01	Starter c/w Solenoid .....	1
6	10614.A01	Starter Switch .....	1
	201105.A02	Wiring Harness (Not illustrated) .....	1

# WIRING DIAGRAM (FULL ROAD LIGHTING KIT)

(PETER & LISTER)



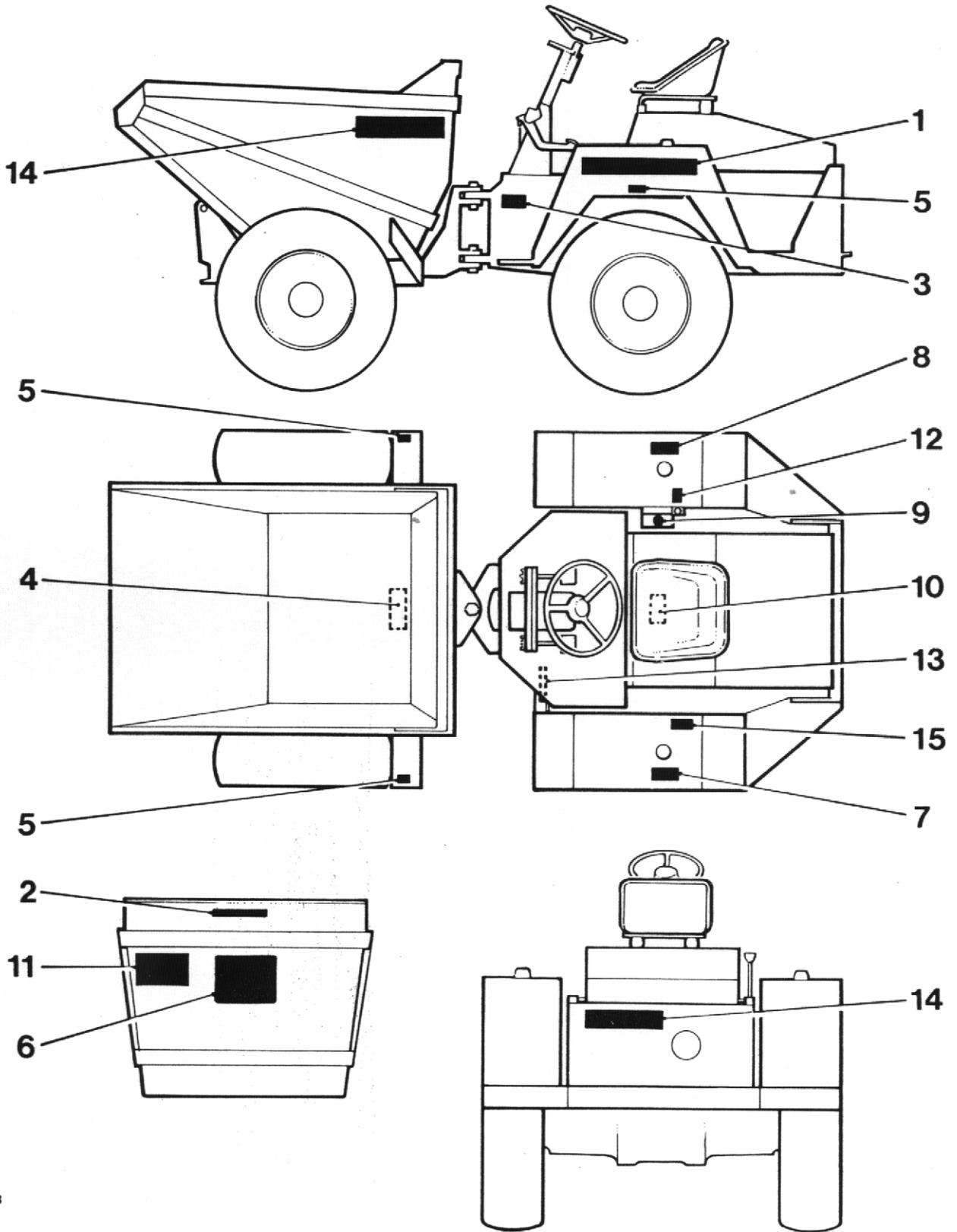
COLOUR CODE	
B	Black
N	Brown
W	White
Y	Yellow
G	Green
R	Red
U	Blue
P	Purple

TP 376

Item No.	Part No.	Description	Qty.
1	20013.A0112	Headlight .....	2
2	FSE 333	Sidelight/Indicator .....	2
	82S.3E	Screw 2BA x 3/4" Long .....	8
	85S.1	Nut, Self Locking 2BA .....	8
	12S.1	Washer .....	8
3	FSE 334	Rear Light/Indicator .....	2
	ESE 176	Rear Light Cowl Assembly .....	1
	82S.3E	Screw 2BA x 3/4" Long .....	8
	85S.1	Nut, Self Locking 2BA .....	8
	12S.1	Washer .....	8
4	10615.A01	Number Plate Light .....	1
5	10644.A01	Fuse Box .....	1
6	10616.A01	Flasher Unit .....	1
	82S.3C	Screw 2BA x 1/2" Long .....	1
	85S.1	Nut, Self Locking 2BA .....	1
	12S.1	Washer .....	1
7	10617.A01	Indicator Switch .....	1
	82S.7C	Screw 6BA x 1/2" Long .....	2
	85S.3	Nut, Self Locking 6BA .....	2
8	10618.A01	Horn complete with Bracket .....	1
9	10619.A01	Horn Button .....	1
	82S.7E	Screw 6BA x 3/4" Long .....	2
	85S.3	Nut, Self Locking 6BA .....	2
10	10620.A01	Light Switch .....	1
11	10216.A01	Stone Guard .....	2
12	10744.A01	Brake Switch .....	1

## OPTIONAL EXTRAS

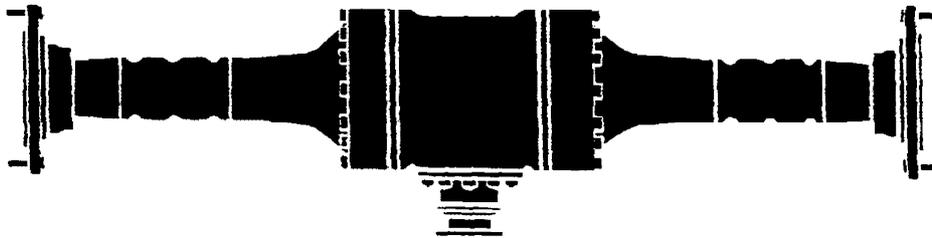
Item No.	Part No.	Description	Qty.
	10213.A04	Rear View Mirror .....	1
	10471.A01	Rubber Ferrule - Mirror .....	2
	10608.A01	Support Arm - Mirror .....	1
	10364.A01	Clamp .....	1
	8S.2F	Bolt Hex. Hd. M6 x 50 Long - Clamp .....	2
	61S.2	Nut Selflocking M6 Binx - Clamp .....	2
	10618.A01	Horn c/w Bracket .....	1
	10619.A01	Horn Button .....	1
	82S.7E	Screw Rd. Hd. 6BA x 3/4" Long - Horn Button .....	2
	85S.3	Nut Nyloc 6BA - Horn Button.....	2
	10607.A01	License Holder .....	1
	10606.A01	Wheel Brace .....	1
	30164.A01	Reversing Siren .....	1
	16S.7B	Setscrew Hex. Hd. M6 x 15 Lg - Reversing Siren ..	2
	7S.2	Nut Hex. M6 - Reversing Siren .....	2
	17S.3	Washer Spring M6 dia. - Reversing Siren .....	2



## LABELS

Item No.	Part No.	Description	Qty.
1	20128.A08	M/C Identification & Payload Label .....	2
2	10541.A01	Payload Label .....	1
3	DM 198	Steering Lock Warning .....	2
4	DM 157	Warning Label (Unpropped Skip) .....	1
5	10540.A01	Tyre Pressure Label (40 p.s.i.) .....	4
6	20132.A02	Dumper Safety & Instruction Label .....	1
7	10546.A01	Diesel Fuel Label .....	1
8	10546.A02	Hyd. Oil Only Label .....	1
9	10284.A01	Dumper Return Label .....	1
10	10536.A01	Warning Label (Unpropped Cover) .....	1
11	DM 196	Lubrication Label (Salisbury Axles).....	1
	10213.A01	Lubrication Label (Hamworthy Axles).....	1
12	ESE 236	Engine "Stop" Label .....	1
13	4-60-233-2	Positive Earth Label (Elec.M/C's only - Petter)..	1
	4-60-233-1	Negative Earth Label (Elec.M/C's only - Lister)..	1
14	DM 154	Winget Label .....	3
15	10215.A02	Filter Instruction Label .....	1

# WINGET



## **NEWAGE 250, 350 & 400 SERIES AXLE SERVICE MANUAL**

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## **Introduction**

Winget Limited gratefully acknowledge the assistance given by Newage Transmissions Limited in the preparation of this manual, however neither Winget Limited or Newage Transmissions can be held responsible for any errors or omissions.

The procedures described within this manual should enable experienced service personnel to strip, repair and re-build Newage 250, 350 & 400 series axles fitted to Winget Site Dumpers and Forklifts in a safe and competent manner. The procedures are not intended to be used by personnel who are unfamiliar with the product or mechanically inexperienced.

It is assumed that personnel are aware of the Health and Safety Regulations which should be applied but the following should act as a reminder.

Whenever possible any repairs or service should be carried out in a clean environment. If work must be carried out on site or in the field steps should be taken to ensure that dirt or foreign materials cannot enter the assembly.

Ensure all work tools are in good condition and only use the correct tool for the job in hand.

Always wear safety spectacles when using soft or hard faced hammers, chisels, drifts or when using air tools. Wear safety spectacles when cleaning components or when grinding.

Do not misuse air lines and be aware of the damage compressed air can cause if misused.

Always make sure lifting equipment is in good condition and the Safe Working Load exceeds the weight of the component to be lifted.

Always use suitable supports i.e. axle stands or baulks of timber in conjunction with hydraulic jacks etc. Never rely on hydraulic jacks alone to support a machine.

Be aware of hot surface temperatures and take care when draining hot oils. Always dispose of waste oils in accordance with local and national regulations.

Whenever possible always disconnect the battery or battery isolator when working on the machine to prevent electrical shorts and unauthorised starting.

Refer to the operators handbook for a guide to the correct sequence for assembling components and sub-assemblies.

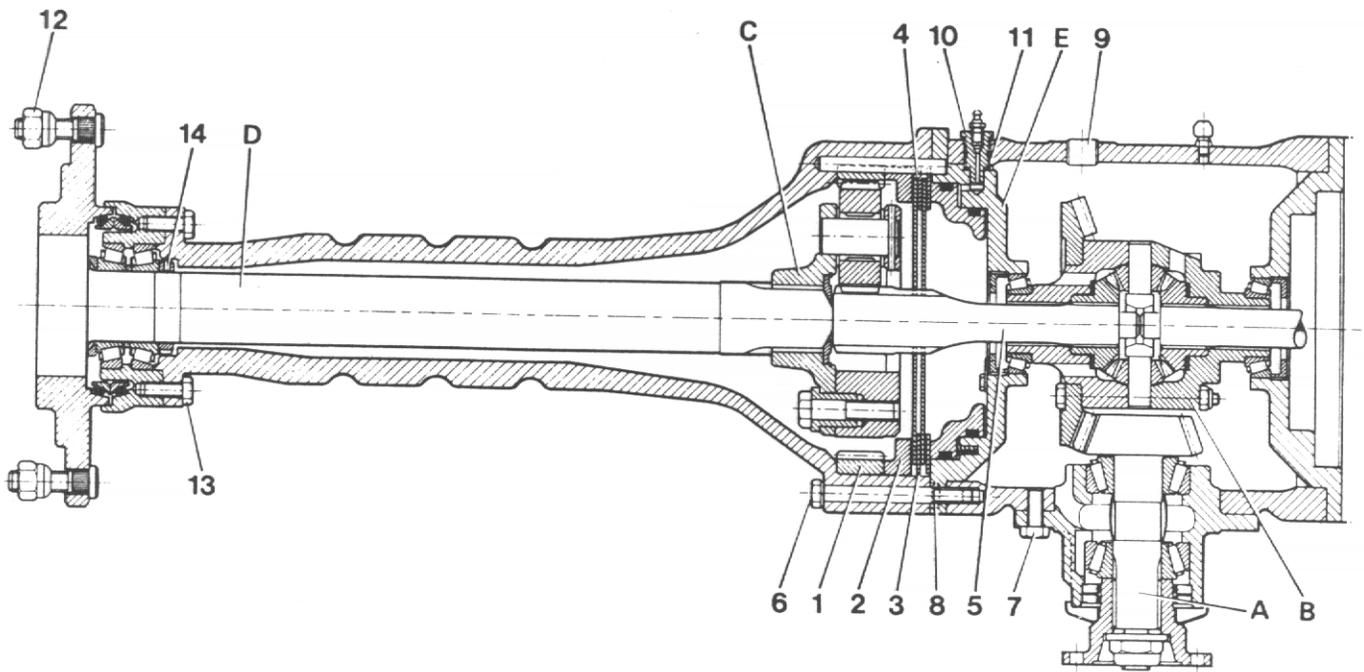
Oils, fuels, silicone sealer etc can cause skin diseases if allowed to contaminate the skin. Always apply barrier creams, wear suitable protective clothing or when contamination is unavoidable clean the area with soap and water as soon as possible. Do not use thinners or other solvents to clean skin.

Health and Safety is a matter of common sense. If common sense is applied correctly the risk of accidents can be reduced.

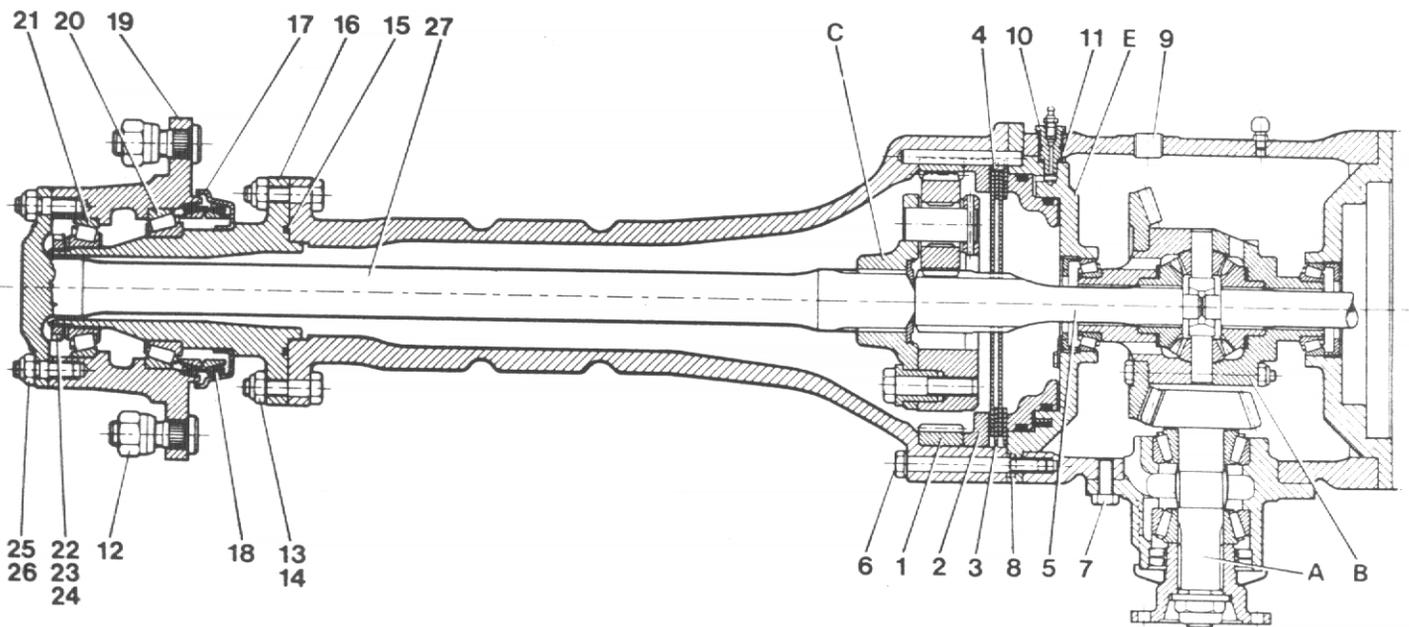
Spares for Newage Axles fitted to Winget Equipment can only be obtained from Winget Limited or one of our authorised distributors and not from Newage Transmissions Limited. Always quote your machines serial number and model together with axle serial number and model when ordering spare parts.

250, 350 & 400 Series axles are designed to operate under arduous conditions and providing they are regularly and correctly maintained they will provide long trouble free service.

Whilst every effort is made to ensure the contents of this manual are accurate Winget Limited and Newage Transmissions reserve the right to alter specification without prior notification and certain sections of this manual may then no longer apply.



TYPICAL AXLE 250 & 400 SERIES



TYPICAL AXLE 350 SERIES

FIG. A

## DISMANTLING AND ASSEMBLING AXLE

### Pinion Cartridge

(See Fig. A)

1. Remove drain plug (9) and drain axle oil, remove screws (7) and pull out cartridge (A), using easing screws if required.

(See Fig. B)

2. Remove nut (5) in coupling flange, (3) holding flange with special tool (AA). Remove flange and knock out pinion (2).
3. If front bearing is damaged or worn, remove cone and roller assembly by splitting cage and using a bearing puller to remove the cone.
4. If required, bearing cups (7) and oil seals (9) can be drifted out from the pinion cartridge.

To re-assemble with new pinion, bearings, seals etc., the procedure is as follows:—

5. Press bearing cups and oil seals into cartridge.
6. Press front pinion bearing to pinion shaft.
7. Pack gap between seal lips  $\frac{3}{4}$  way round with grease.
8. Assemble pinion to cartridge, push on spacer (8) and tail bearing drive flange, washer and nut. (Check drive flange, seal wear surface is free from damage.)

NOTE: If new bearings are fitted, a new collapsible spacer (8) must be fitted.

9. Tighten nut (5) holding coupling flange with special tool, until bearing spacer collapses 21 kpm (150 lb. ft. min.) and continue to tighten until all pinion end float is removed.
10. Turn nut until a drag is felt when turning the coupling flange and check the bearing preload using a piece of string wound round the flange and a spring balance (see Fig. C).

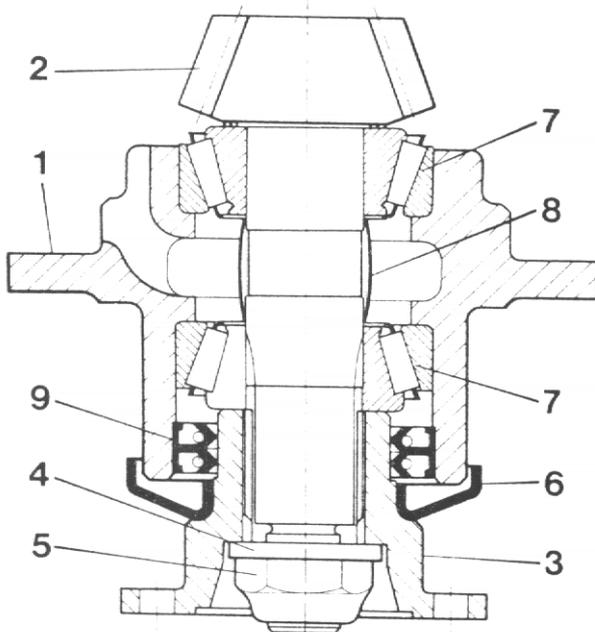


FIG. B

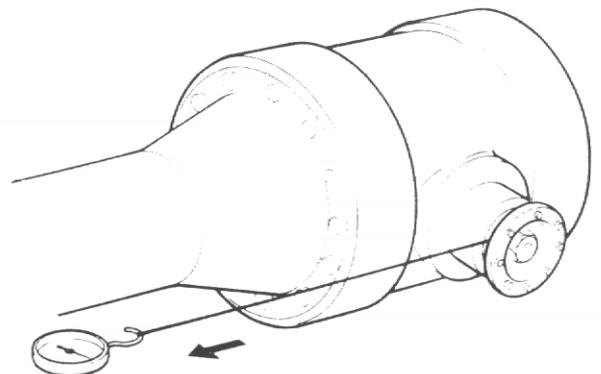


FIG. C

11. Pull the spring balance until the pinion turns smoothly and note the reading (should be 3.5–5.5 kg for new bearings and (1.75–2.75 kg) for old bearings on the 250 Series and 350 Series axles, and 4.5 – 6.5 kg for old bearings on the 400 Series axle.
12. Gradually tighten nut and re-check until correct reading is obtained.

NOTE: Above preload figures should not be exceeded.

13. Assemble pinion cartridge to centre casing, applying sealer between shims, centre case flange and cartridge flange.

NOTE: Ensure cartridge oil slot is in correct position (see Fig. D).

14. Tighten screws holding cartridge to main case.

### Crownwheel and Differential (Ref. B)

(See Fig. A)

1. Drain axle oil, remove screws (6) and pull off left hand axle arm assembly.
2. Remove brake feed and bleed adaptors (10).
3. Slacken screws (8) and remove brake cylinder (E) using easing screws if required.
4. Lift out crownwheel and differential assembly (B).
5. Slacken nuts (11) (See Fig. E), remove crownwheel and split differential unit.
6. Thrust washers (5) and (6) should be replaced if they show signs of damage or excessive wear.
7. Check all internal rubbing surfaces of diff. cases (1) for signs of wear.
8. Diff. bearing cone and roller assys. (9) can be pulled or drifted off diff. case halves.

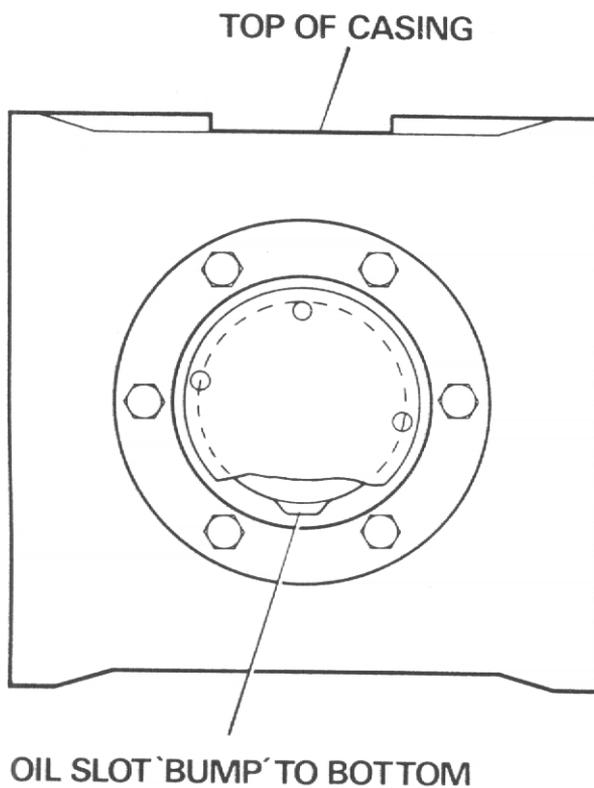


FIG. D

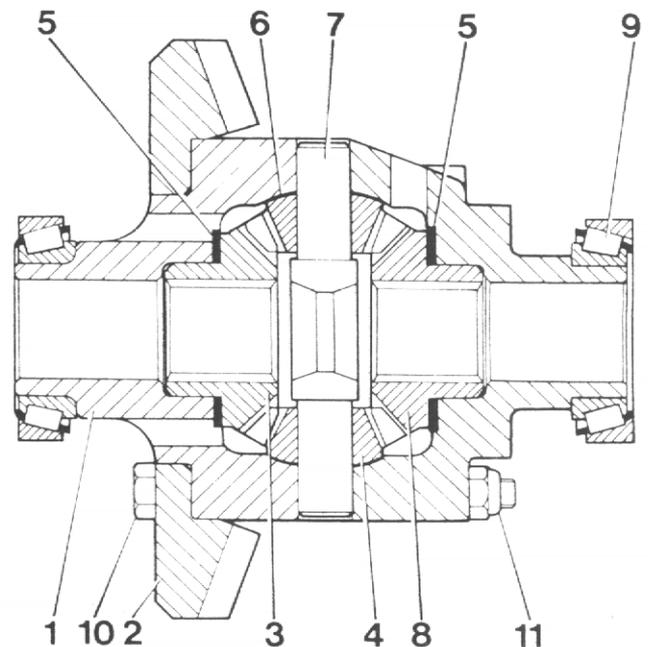


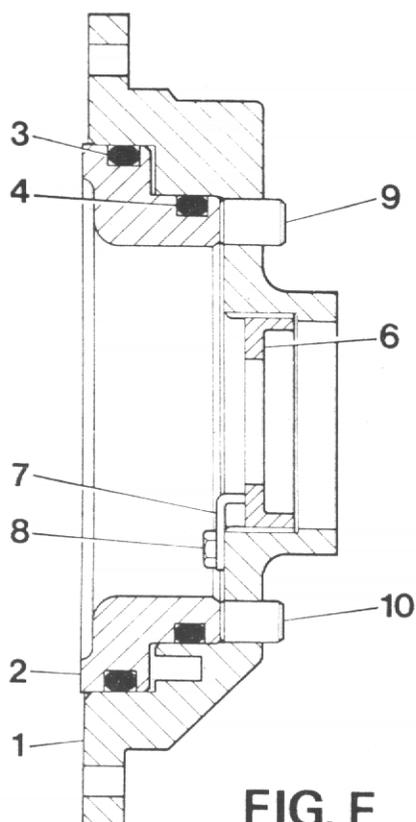
FIG. E

9. Re-assemble differential unit, ensuring that typed marks on diff. halves are aligned.
10. Assemble crownwheel, bolts (10) and torque up nuts (11).
11. Engage a sun gear (7) in a diff. gear and ensure that differential gears turn freely.
12. Press on new diff. bearings if required.
13. If diff. bearings are not replaced, then the diff. can be put back in the centre case and the brake cylinder replaced, without adjusting the bearing nuts (6). (See Fig. F)

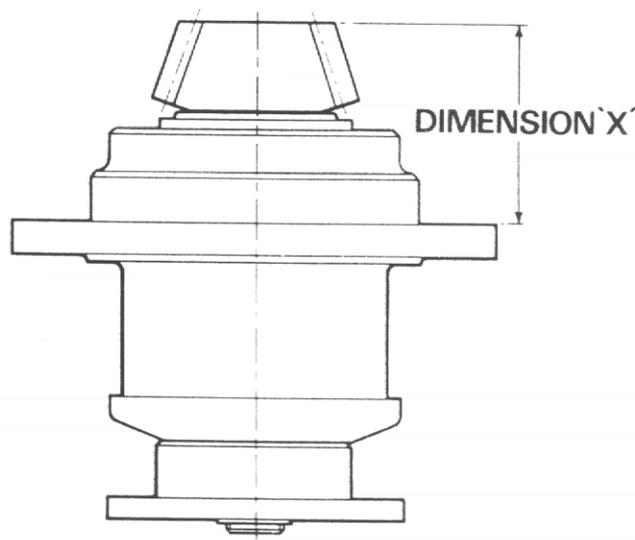
14. If the diff. bearings are replaced, then it will be necessary to reset the crownwheel backlash and the bearing preload. (See Crownwheel and Pinion Set Up.)
15. Brake cylinder, centre case and axle arm flange faces should be cleaned, oil sealer scraped off and new sealer applied prior to re-assembly.
16. Replace brake cylinder and axle arm assembly, all screws and bolts being tightened to the correct torque.

### Setting up Crownwheel and Pinion

1. Assemble pinion cartridge as described previously.
2. Assemble crownwheel and diff. assembly as described.
3. Assemble and seal one cylinder to main casing using screw (8) (See Fig.A). Push in diff. bearing cup and screw in lock ring (6) (See Fig. F).
4. Stand centre case on cylinder end and lower in diff. assembly, locating the diff. bearing halves together and ensuring that crownwheel and pinion are in mesh.
5. Seal and fit other brake cylinder and assemble bearing cup and lock ring.
6. Tighten lock ring until bearing end float is removed.
7. On pinion cartridge use a depth gauge to measure dimension 'X' from front face of pinion to cartridge flange (see Fig.G).



**FIG. F**



**FIG. G**

8. On centre case use a depth gauge to measure dimension 'Y' from pinion cartridge flange surface to ground diameter on differential casing (see Fig. H).
9. Read pinion mounting distance (M.D.) from front face of pinion. Pinion head thickness = (see front face of pinion), diff. case ground diameter = 129.50 mm. on the 400 series and 108.76 mm. on the 250 series. and 108.76mm on the 350 Series. Calculate as follows:

$$(M.D. - \text{Head thickness} - \frac{\text{Diff. case dia.}}{2}) = 'A'$$

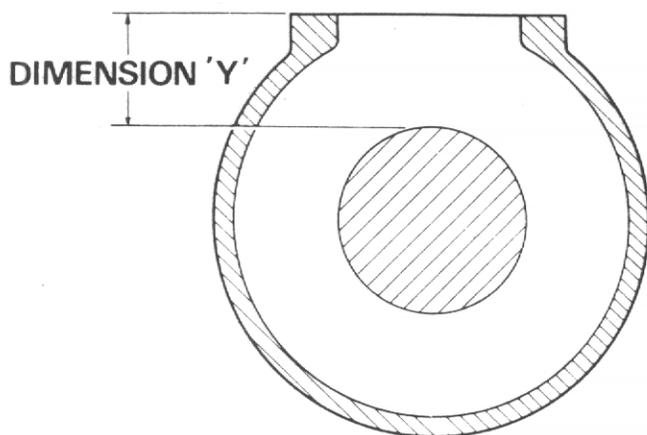
$('A' - 'B') = Shim thickness to be placed between pinion cartridge flange and centre case flange.$

10. Select shims, place on pinion cartridge and assemble cartridge to centre casing.

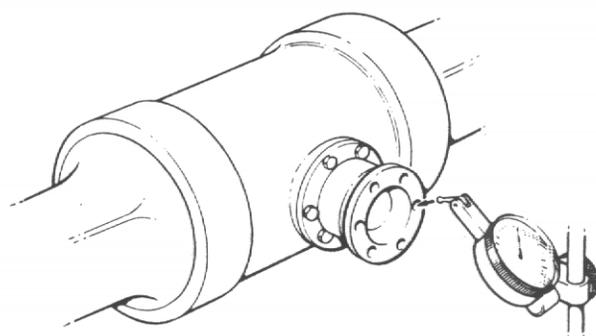
NOTE: It is required to know the spring balance reading required to turn pinion in its bearings, as described previously.

11. Adjust diff. bearing lock rings to give correct backlash between crownwheel and pinion.  
(See Page 12)

This can be measured by using a dial gauge with its pointer in a coupling flange hole (see Fig. J).



**FIG. H**



**FIG. J**

12. Tighten lock rings equally at each end of the differential to preload the bearings. The preload can be checked by turning the pinion coupling flange by means of string and spring balance as previously described. (Check that backlash is maintained.)

13. The additional spring balance load for the diff. bearings is shown.

14. Slacken and remove screws holding pinion cartridge in place and pull out cartridge. Brush on some paint, Engineers Blue etc. to a few crownwheel teeth and replace the pinion cartridge.

15. Turn the coupling flange a few turns in both directions then slacken screws and lift out.

16. Examine the contact on both sides of the crownwheel teeth and check that it is similar to that shown in fig. S and is similar to original factory marking shown on teeth.

17. If marking is satisfactory, replace pinion cartridge with sealer on flange surfaces and torque up screws.

(See Fig. F)

18. Put lock tabs (7) in place in cylinders and tighten screws (8). (Ensure that screws have locking compound applied.)

19. Bend over locking tabs into slots in lock rings (6).

#### **Planetary Gears (Ref. C)**

1. Drain axle oil and remove axle arm as explained previously.

(See Fig. A)

2. Lift out sun shaft (5), brake plates (2, 3 & 4) and planetary assembly.

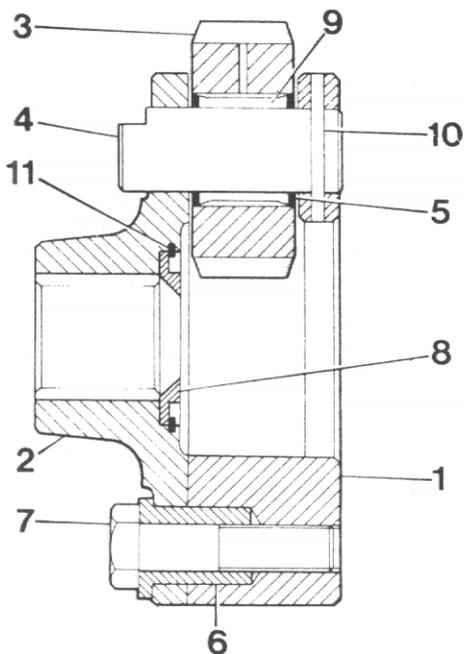
(See Fig. K)

3. Check planet gear (3) end float using feelers. (Should not be greater than 2mm.)

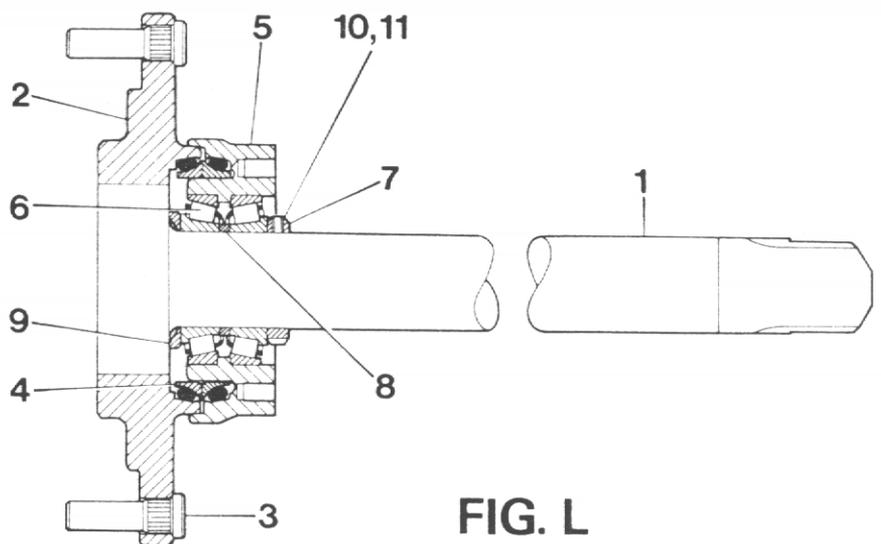
4. Remove lock wire where used, slacken bolts (7) and tap bolt heads to split planetary assembly.

5. Lift off planet gears (3), thrust washers (5) and needle bearings (9).

6. Inspect all parts for wear or damage and replace if required.
  7. If planet pins (4) are worn, remove by drifting out spring pin (10), and push planet pin from hole in planet carrier (1).
- NOTE: On re-assembly, tap in spring pin until flush with outside of planet carrier and peen over edge of hole.
8. To assemble, place gears, washers, bearings etc. on planet pins and locate carrier drive flange (2) on planet pins and push both halves together.
  9. Push dowels (6) home, tighten bolts and fit lock wire if required.
- (See Fig. A)
10. If annulus (1) shows signs of wear, remove using puller (BB) and fit new part. (Ensure that new annulus is fully home in its location bore.)
  11. Check axle shaft (1) (see Figs. L & N), splines for wear or damage and if satisfactory, locate planetary on splines.
  12. Re-assemble sun shaft, brake plates, etc. clean axle arm and brake cylinder flange faces, re-seal and assemble axle arm as previously described.



**FIG. K**



**FIG. L**

### Brakes

1. The dismantling procedure is the same as for the planetary gears.
2. When the sintered plates and the fixed plates are removed from the axle arm, examine both for excess wear. The thickness of the sintered plate should not be less than 4mm. The thickness of the fixed plate should not be less than 2mm.
3. To check the piston/cylinder assembly it is not essential to remove the cylinder from the centre case, but if required, remove brake feed and bleed fittings (10), screws, (8) (see Fig. A) and lift out cylinder from centre case using easing screws if required.

(See Fig. F)

4. Pull the piston (2) from the cylinder and examine the seals (3 & 4) and cylinder walls for signs of damage.

5. When refitting the piston to the cylinder ensure that the 3 springs (5) are in place in their holes in the rear of the cylinder.
6. Clean and seal cylinder and centre case flange surfaces and bolt cylinder in place with screws (8). (See Fig. A)
7. Examine brake plate splines for damage before assembling to sun shaft.

NOTE: When plates are assembled to sun shaft, ensure that holes line up to ensure an oil passage through the plates.

8. Assemble all brake plates and axle arm as previously described.
9. Re-fit, brake bleed and feed adaptors (10) if removed, ensuring that sealing washer (11) is properly located. (See Fig. A)

#### IMPORTANT NOTE

The axle utilises a hydraulic braking system and 2 different types of hydraulic fluid are used.

1. A conventional synthetic brake fluid system; (fluid to SAE J1703) the fluid is contained in a conventional master cylinder reservoir.  
(Note: Piston/cylinder seals 3 & 4 (See Fig. F) will be blue in colour).
2. A mineral brake fluid system; the fluid is contained in the vehicle hydraulic tank.  
(Note: Piston/cylinder seals 3 & 4 (See Fig. F) will be black in colour).

For the conventional brake fluid system, the following note applies;

#### IMPORTANT

It is essential that all cylinder bores, pistons, and seals, are kept clean and free from all lubricating oils. The seals can be lightly coated with brake fluid to SAE J1703 prior to assembly.

For the mineral fluid system, the following note applies;

#### IMPORTANT

It is essential that all cylinder bores, pistons, and seals are kept clean prior to assembly. They may be coated with one of the MINERAL hydraulic oils listed. They MUST NOT be coated with standard "vegetable" based fluid (SAE J1703).

#### Axle Shaft Assembly (400 series axle)

(See Fig. A)

1. Slacken and remove screws (13) holding assembly to axle arm.
2. Tap rear of wheel flange to remove shaft assembly from axle arm.

(See Fig. L)

3. Slacken screw (11) in shaft locking ring (7) and unscrew locking ring using special tool (CC).
4. Tap seal housing (5) to remove from axle shaft.
5. Inspect bearings, oil seals and shaft for signs of wear or damage.
6. If a new oil seal is required, it is advisable to fit using the special tool (DD). (See Fig. M)
7. If new shaft bearings are required, they are supplied complete with the shaft spacer and are preset to give the correct running adjustment. Remove the old bearing cups (6) from the oil seal housing and fit new parts. Assemble the oil seal halves to the wheel flange and the oil seal housing.
8. Assemble the bearing/seal housing assembly to the axle shaft and tighten the locking ring behind the bearings.
9. Tighten the screw (11), compressing the nylon insert (10) onto the threaded part of the shaft.
10. Clean the rear surface of the oil seal housing and the axle arm flange surface. Reseal, fit the shaft assembly to the axle arm and tighten screws (13). (See Fig. A)

#### Axle Shaft Assembly (250 series axle)

(See Fig. A)

1. Slacken and remove screws (13) holding assembly to axle arm.
2. Tap rear of wheel flange to remove shaft assembly from axle arm.

(See Fig. N)

3. Slacken screw (15) in shaft locking ring (7) and unscrew locking ring using special tool CC.
4. Tap seal housing (5) to remove from axle shaft.
5. Inspect bearings, oil seals and shaft for signs of wear or damage.
6. If a new oil seal is required, it is advisable to fit using the special tool DD (see Fig. M).
7. A single unitised taper roller bearing is used and if a new unit is required, then it is necessary to adjust shims (10 to 13) to provide the correct clamping load on the bearing. The procedure is as follows:—
  - a) Remove old bearing from oil seal housing and fit new unit.
  - b) On small end of axle arm, use a vernier depth gauge to measure from the end of the spigot location on the flange (see Fig. P). Let this dimension be 'X'.
  - c) Measure the depth inside the oil seal housing, from the mating face with the axle arm to the end of the bearing outer race. Let this dimension be 'Y'. (See Fig. R)
  - d) The amount of shims to go adjacent to the bearing = ('Y' - 'X') + 0.075 mm (0.003").
  - e) Insert the necessary shims in the oil seal housing.

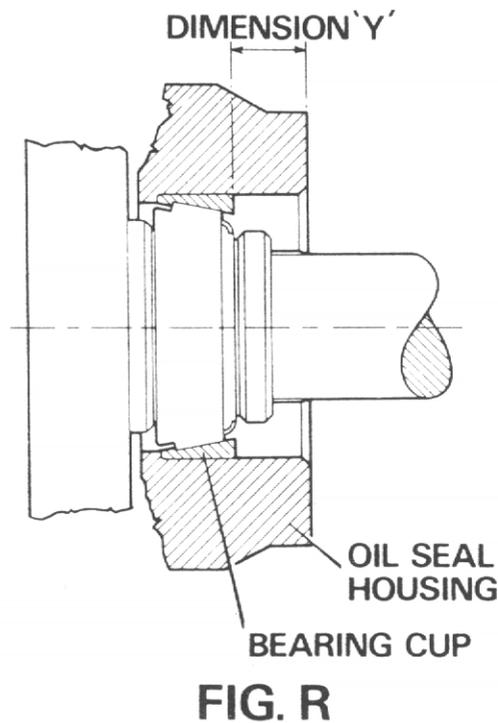
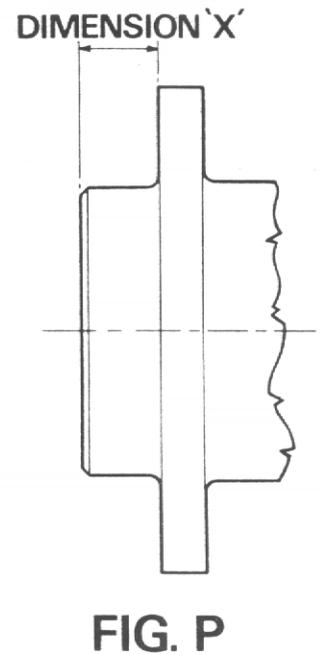
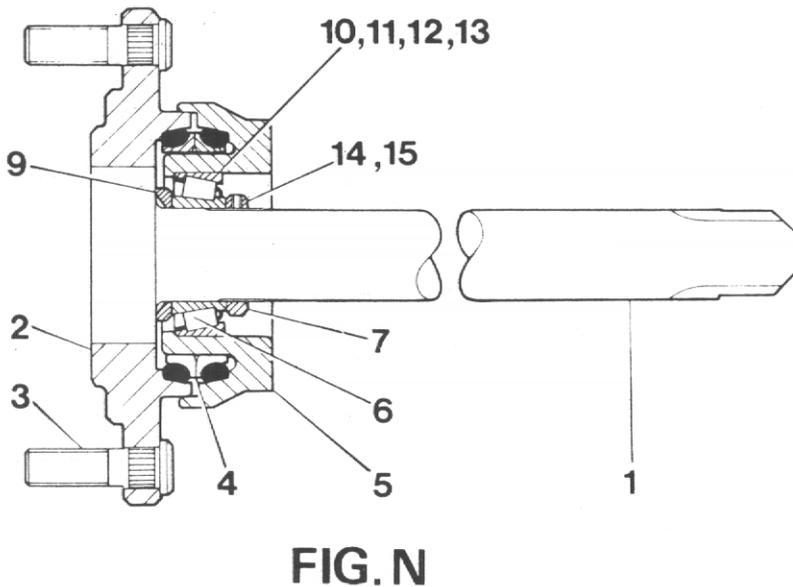
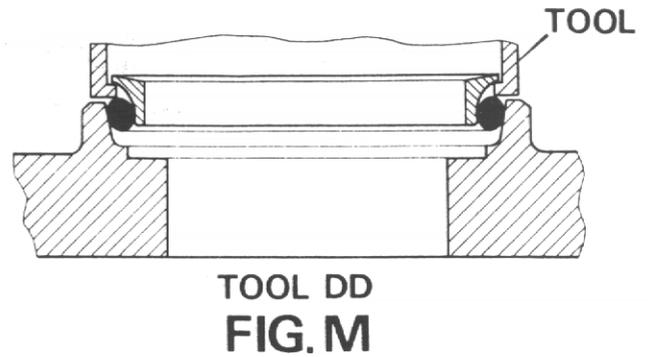
(See Fig. N)

8. Assemble the oil seal housing to the shaft (1) and tighten the locking ring (7).
9. Tighten the screw (15), compressing the nylon insert (14) onto the threaded part of the shaft.
10. Clean the rear surface of the oil seal housing and the axle arm flange surface. Reseal, fit the shaft assembly to the axle arm and tighten screws (13). (See Fig. A)

#### Stub Axle and Wheel Hub

1. To remove the complete assembly from the axle arm, remove nuts and bolts (13, 14) and pull out straight until the axle shaft disengages on its splines (27).
2. The assembly is the reverse of the above, the axle shaft splines being engaged first. Care should be taken to ensure that the 'O' ring (15) does not fall from its groove in the stub axle.
3. If it is only required to remove the hub (19) from the stub axle, first slacken nuts (26) and remove axle shaft using easing screws if required.
4. Release tab washer (24) slacken lock ring (23) using special tool (EE). Remove the lock ring, tab washer and tongued washer (22).  
Note: A new tab washer (24) must be fitted each time the assembly is dismantled.
5. Pull the hub assembly from the stub axle, tapping the rear of the wheel flange with a mallet if required.
6. The hub bearing cone and roller assemblies and cups can now be examined for wear or damage (20, 21). So also can 2 halves of the oil seal (18).  
Note: If the rubbing faces of the metal oil seal halves are damaged or scored, then the seal must be replaced.
7. The hub bearing can be drifted out if required.
8. Inspect the bearing journals on the stub axle (16) for signs of wear or damage.
9. To fit new oil seal halves to the hub and oil seal housing (17) the use of special tool (DD) is recommended (See illustration). Coat the rubbing faces of the seal with axle oil prior to assembly.
10. To reassemble the hub, to the stub axle, push the hub, bearings and seal assembly along the stub axle, against the bearing shoulders.
11. Assemble lock ring, tab washer and tongued washer and tighten lock ring to a torque of 14 kpm (100 lbf). Back the nut off an amount equal to the width of 2 tabs on the washer, and bend over a tab into a slot in the lock ring. Ensure that the hub will turn freely on its bearings.
12. Examine the axle shaft splines for damage, clean the flange face of old sealer and also the mating hub face, and then assemble the shaft to the hub.

13. Tighten nuts (26).
14. If the oil seal housing (17) becomes damaged, it is necessary to first remove the wheel hub. The unit can then be drifted from its seating on the stub axle.
15. To fit a new unit, the seating on the stub axle should first be cleaned and new "Loctite" grade 275 applied to the stub axle and seal housing surfaces. The housing can then be pressed or drifted into place.



**Surfaces to be Sealed with Liquid Sealant**  
 Use "Loctite Plastic Gasket" Grade 275  
 "Avdelbond" Grade 120/121 OR Similar

1. Pinion cartridge flange to main casing.
2. Brake cylinder flanges to main casing.
3. Axle arm to brake cylinder.
4. Oil seal housing to axle arm flange.
5. Cover plate to top of main casing.

Apply a thin film of sealant to one of the surfaces, having first cleaned the surfaces concerned. Assemble the parts and tighten fasteners.  
 Having dismantled an assembly, scrape old sealant off the surfaces, clean and apply fresh solution.

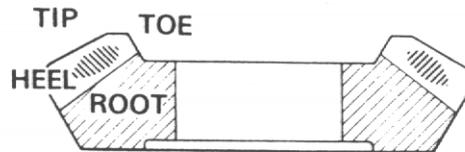
# SPIRAL BEVEL GEAR TOOTH CONTACTS

## CROWN WHEEL

### CONVEX FLANK & CONCAVE FLANK

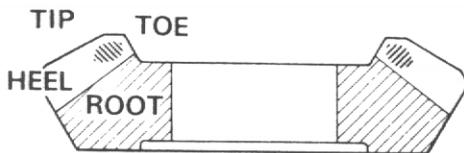
Contact may vary, but generally is approx, in the tooth centre, equispaced between root and tip. The marking may be towards toe on some gears on both flanks, or marking crossed slightly i.e. towards toe on convex flank and heel on concave flank or vice versa.

If, compared to the factory tooth contact, the contact appears as shown below, then corrective action should be taken as follows:



#### 1 CONVEX FLANK

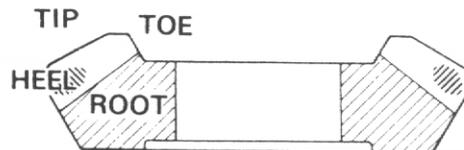
Contact further to toe and tip than factory marking.



#### CONCAVE FLANK

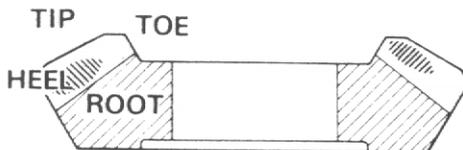
Contact further to heel and tip than factory marking.

ERROR: Pinion too far out of mesh, recheck and decrease shims below pinion cartridge flange.



#### 2 CONVEX FLANK

Contact further to heel and root than factory marking.



#### CONCAVE FLANK

Contact further to toe and root than factory marking.

ERROR: Pinion too far into mesh, recheck and increase shims below pinion cartridge flange.

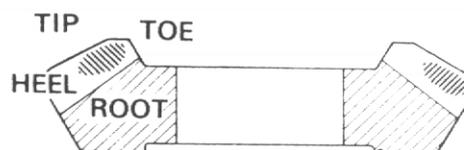


FIG.S

**ADDITIONAL LOAD ON SPRING BALANCE FOR DIFFERENTIAL BEARING PRELOAD WHEN CROWN WHEEL & PINION ARE IN MESH.**

**400 Series.**

No. Teeth Pinion	No. Teeth Wheel	Additional Spring Balance Pull (Kg)	
		New Brgs.	Used Brgs.
11	31	2.75-3.25	1.4-1.8
11	29	3.0 -3.4	1.4-1.8
18	33	4.0 -5.0	2.0-2.5

**250 and 350 Series**

No. Teeth Pinion	No. Teeth Wheel	Bolt Circle Dia. Coupling Flange (mm)	Additional Spring Balance Pull (Kg)	
			New Brgs.	Used Brgs.
11	29	95	3.8-5.2	2.0-2.7
17	29	95	5.9-8.0	3.0-4.1
11	29	80	4.1-5.7	2.0-3.0
17	29	80	6.6-8.8	3.2-4.3

**TORQUE SETTINGS FOR ALL FASTENERS (SERIES 250 & 350)**

<i>Fastener Ref. No. Fig. A.</i>	<i>Description</i>	<i>Tightening Torque</i>	
		<i>Kpm. (lb. ft.)</i>	
(Diff. Assy.)	M10 Bolt + Nut	5.6	( 40)
(Planetary Assy.)	M12 Bolt	10	( 72)
(Brake Cyl. Assy.)	M12 Cap Screw	10	( 72)
6	Axle Arm—Main Case Bolts	5.6	( 40)
7	Pinion Cart.—Main Casing Screws	5.6	( 40)
8	Brake Cyl.—Main Case Screws	5.6	( 40)
10	Brake Pipe Adaptor—Brake Cyl.	2.7	( 20)
12	Wheel Nut (18 mm)	28	(200)
	Wheel Nut ( $\frac{7}{8}$ " BSF)	42	(300)
13	Axle Arm—Oil Seal Housing (250 only)	5.6	( 40)
14	Axle Shaft Locking Ring (250 only)		(350)

**TORQUE SETTINGS FOR ALL FASTENERS (SERIES 400)**

<i>Fastener Ref. No. Fig. A.</i>	<i>Description</i>	<i>Tightening Torque</i>	
		<i>Kpm. (lb. ft.)</i>	
(Diff. Assy.)	M10 Bolt + Nut	5.6	( 40)
(Planetary Assy.)	M16 Bolt	25	(180)
(Brake Cyl. Assy.)	M12 Cap Screw	10	( 72)
6	Axle Arm—Main Case Bolts	10	( 72)
7	Pinion Cart.—Main Casing Screws	10	( 72)
8	Brake Cyl.—Main Case Screws	10	( 72)
10	Brake Pipe Adaptor—Brake Cyl.	2.7	( 20)
12	Wheel Nut (18 mm)	28	(200)
	Wheel Nut ( $\frac{7}{8}$ " BSF)	42	(300)
13	Axle Arm—Oil Seal Housing	10	( 72)
14	Axle Shaft Locking Ring	62	(450)

**LIST OF BACKLASH FIGURES FOR DIFFERENT RATIOS ETC.**

400 Series	No. Teeth Pinion	Backlash Measured via Hole in Flange (mm)
	11	0.31-0.39
	18	0.21-0.26

**250 and 350 Series**

No. Teeth Pinion	Bolt Circle Dia. on Flange	Backlash Measured via Hole in Flange (mm)
11	95	0.27-0.36
17	95	0.17-0.23
11	80	0.22-0.30
17	80	0.14-0.19

## DECIMAL, FRACTIONAL AND METRIC EQUIVALENTS

Inches		Milli- metres	Inches		Milli- metres
Fractions	Decimals		Fractions	Decimals	
1/64	0.015625	0.397	33/64	0.515625	13.097
1/32	0.03125	0.794	17/32	0.53125	13.494
3/64	0.046875	1.191	35/64	0.546875	13.891
1/16	0.0625	1.588	9/16	0.5625	14.288
5/64	0.078125	1.984	37/64	0.578125	14.684
3/32	0.09375	2.381	19/32	0.59375	15.081
7/64	0.109375	2.778	39/64	0.609375	15.478
1/8	0.125	3.175	5/8	0.625	15.875
9/64	0.140625	3.572	41/64	0.640625	16.272
5/32	0.15625	3.969	21/32	0.65625	16.669
11/64	0.171875	4.366	43/64	0.671875	17.066
3/16	0.1875	4.763	11/16	0.6875	17.463
13/64	0.203125	5.159	45/64	0.703125	17.859
7/32	0.21875	5.556	23/32	0.71875	18.256
15/64	0.234375	5.953	47/64	0.734375	18.653
1/4	0.250	6.350	3/4	0.750	19.050
17/64	0.265625	6.747	49/64	0.765625	19.447
9/32	0.28125	7.144	25/32	0.78125	19.844
19/64	0.296875	7.541	51/64	0.796875	20.241
5/16	0.3125	7.938	13/16	0.8125	20.638
21/64	0.328125	8.334	53/64	0.828125	21.034
11/32	0.34375	8.731	27/32	0.84375	21.431
23/64	0.359375	9.128	55/64	0.859375	21.828
3/8	0.375	9.525	7/8	0.875	22.225
25/64	0.390625	9.922	57/64	0.890625	22.622
13/32	0.40625	10.319	29/32	0.90625	23.019
27/64	0.421875	10.716	59/64	0.921875	23.416
7/16	0.4375	11.113	15/16	0.9375	23.813
29/64	0.453125	11.509	61/64	0.953125	24.209
15/32	0.46875	11.906	31/32	0.96875	24.606
31/64	0.484375	12.303	63/64	0.984375	25.003
1/2	0.500	12.700	1	1.000	25.400

## INCHES INTO MILLIMETRES

Inches	0	1	2	3	4	5	6	7	8	9
0	0	25.40	50.80	76.20	101.60	127.00	152.40	177.80	203.20	228.60
10	254.00	279.40	304.80	330.20	355.60	381.00	406.40	431.80	457.20	482.60
20	508.00	533.40	558.80	584.20	609.60	635.00	660.40	685.80	711.20	736.60
30	762.00	787.40	812.80	838.20	863.60	889.00	914.40	939.80	965.20	990.60
40	1016.00	1041.40	1066.80	1092.20	1117.60	1143.00	1168.40	1193.80	1219.20	1244.60
50	1270.00	1295.40	1320.80	1346.20	1371.60	1397.00	1422.40	1447.80	1473.20	1498.60
60	1524.00	1549.40	1574.80	1600.20	1625.60	1651.00	1678.40	1701.80	1727.20	1752.60
70	1778.00	1803.40	1828.80	1854.20	1879.60	1905.00	1930.40	1955.80	1981.20	2006.60
80	2032.00	2057.40	2082.80	2108.20	2133.60	2159.00	2184.40	2209.80	2235.20	2260.00
90	2286.00	2311.40	2336.80	2362.20	2387.60	2413.00	2438.40	2463.80	2489.20	2514.61

Use in conjunction with above table.

Example: Find equivalent mm. for 84 5/8".

$$84'' = 2133.60 \text{ mm.}$$

$$5/8'' = 15.875 \text{ mm.}$$

$$84 \text{ } 5/8'' = 2149.475 \text{ mm.}$$

# CALIFORNIA

## Proposition 65 Warning

**Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm**