Automobile Association

Approval Certificate

This is to Certify

Fairey Winches Ltd.,

of Plymouth Road,

Tavistock, Devon.

is authorised to use the Seal of Approval of the Automobile Association in respect of the article designated below which has been tested and Approved by the Association.

This Certificate shall remain in force until the 14th day of February 1974 and may be renewed annually by the Association subject to the Terms of Agreement.

Dated this 14th day of February 1973

G. F. Chapman Chairman Approvals Board

Manager, Technical Services

Certificate No 048

Article in respect of which the Seal is granted

Fairey Free-Wheeling Hubs

This Certificate is not transferable and remains the property of the Automobile Association.

Report No TS140

FAIREY FREE-WHEELING HUBS

FOR LAND ROVERS

Tests and Report by :

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Technical Services

Checked by :

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Technical Services

30th January 1973

1 INTRODUCTION

Manufactured by Fairey Winches Limited, Plymouth Road, Tavistock, Devon, free-wheeling hubs are one of a small range of accessories made by the company for Land Rovers.

The purpose of the device is to isolate the front wheels from transmission drag when four-wheel drive is not engaged and it is claimed to improve fuel consumption, reduce wear on transmission and tyres, and relieve the Land Rovers natural tendencies to heavy steering.

This accessory has been officially recognised and approved by the Rover Company, Solihull and is sold by them through their dealers

Tests were carried out on short and long wheel base Land Rovers, both of which were powered by petrol engines.

2 CONCLUSIONS

2.1) Results from previous and current tests, with short and long wheel base petrol Land Rovers show petrol consumption gains ranging from 4—19%. These variations being mainly due to the type of vehicle and the use and load to which they were subjected. In general, it would appear that the greatest benefits in improved fuel consumption would be obtained by the owner who makes frequent short journeys in a lightly loaded vehicle.

2.2) Fitting of the device is within the capability of the average DIY man, taking approximately one hour to complete, the only special tool required being a torque wrench. The instructions, photographs and diagrams are comprehensive giving a step-by-step guide to installation.

2.3) A reduction in the noise from the front axle was evident although no lightening of steering effort could be detected. Tests carried out were too short to record on tyre or transmission wear, but the units have been left on the long wheel base Land Rover for further evaluation.

3 RECOMMENDATIONS

Fitting instruction 11 states that the hubs are cleaned and greased at the factory and that no further lubrication is required until the vehicle is serviced in the normal way. When, during our tests, the existing hubs were removed, oil was lost. Whilst the amount lost was probably safe to drive without, we feel the instruction should include a warning to check the level on completion and top up with recommended lubricant as necessary.

4 EXAMINATION

4.1) Packaging

The device was received packed in a cardboard box marked as Genuine Rover Parts and carrying the Rover and Land Rover insignias. It was sent to us in this manner through the post with no other form of outside packing, and although it had obviously received rough handling in transit, the internal packing protected it quite adequately.

The two units were separated from each other inside the box by corrugated cardboard. This also surrounded the inside wall of the box and covered the

12 securing bolts, which were placed at either end of the box and held the two units firmly in position. The instructions and a plastic bag sat on top of the units. The bag contained four gaskets, two rubber and felt seals and two cotter pins.

4.2) Instructions

The instructions (a copy is attached to the rear of this report) are divided into 17 stages with important points defined in darker print. Clear photographic prints are successfully used to complement the written instructions. An exploded diagram on the rear of the leaflet numbers each part. These numbers coincide with a parts list that gives the name and part numbers of all the parts used.

A windscreen warning sticker is also included in the kit warning drivers not to engage four-wheel drive whilst the vehicle is in motion. Also to check hubs are in the fixed position before the transfer box is used.

5 OPERATION AND FITTING OF THE HUBS

Fitting of the device was uncomplicated, the units replacing the standard hubs on the existing drive line. The complete operation took approximately one hour. The hubs are operated by turning a hexagon nut a quarter of a turn until an arrow on the centre of the hub lines up with an arrow marker fixed or free on the outer edge. No special tools are required other than a torque spanner capable of reaching 28 lbs. ft.

6 TESTS

Tests were carried out at MIRA proving ground, Nuneaton, using an MGA Petrometa to measure fuel consumption and a fifth wheel for accurate speed readings.

6.1) Results for Short Wheel Base

Weather conditions: Dry, 8-12mph wind; 7°C

Fuel consumption at steady speeds in top gear

	Hubs fixed	Hubs free-wheeling
mph	mpg	mpg
30	20·6	24·5
40	18·2	21·4
50	16·1	17·8
60	14·4*	15·0
Average	17·1	19·0

Stop-start circuit test

mph	mpg	mpg
30	16·0	19·9
40	14·0	16·1
50	12·6	13·4
Average	14·3	16·2
Overall	15·8	17·7

*60 mph attainable only on straight sections of triangular circuit.

Acceleration times in top gear

mph	seconds	seconds
20-40	15·9	15·0
30-50	21·1	19·2

6.2) Results for Long Wheel Base— Unladen

Weather conditions: Freezing fog, calm; 0°C

Fuel consumption at steady speeds in top gear

	Hubs fixed	Hubs free-wheeling
mph	mpg	mpg
30	20·1	23·1
40	18·3	20·0
50	14·9	15·6
60	13·3	13·5
Average	16·6	18·1

Stop-start circuit tests

mph	mpg	mpg
30	18·2	19·0
40	15·6	16·1
50	12·5	13·0
Average	15·4	16·0
Overall	14·7	15·7

Acceleration times in top gear

mph	seconds	seconds
20-40	15·6	15·5
30-50	19·1	18·1

6.3) Results for Long Wheel Base—With 2,000lb. load + three occupants

Fuel consumption at steady speeds in top gear

mph	mpg	mpg
30	21·0	22·0
40	18·6	19·1
50	15·3	15·7
Average	17·3	18·0

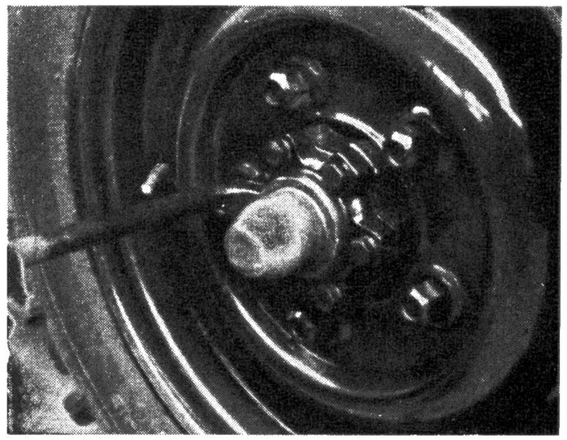
Stop-start circuit tests

mph	mpg	mpg
30	17·3	18·5
40	14·6	15·1
Average	15·9	16·8
Overall	15·8	16·5

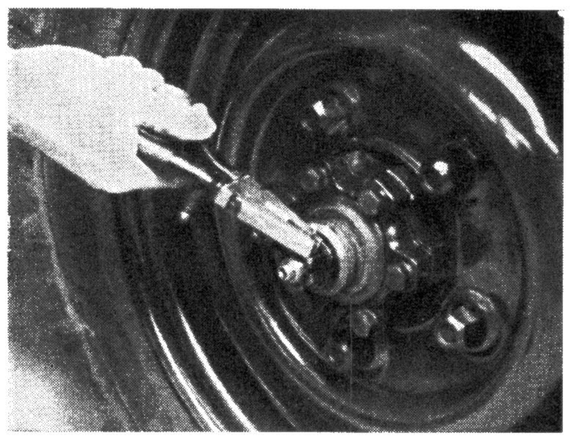
The above figures were recorded after allowing engine and transmission oil temperatures to stabalise. However, it was noted during preliminary tests on the motorway that transmission oil temperatures did influence fuel consumption figures especially with the hubs fixed. For instance, with hubs fixed, fuel consumption was reduced by 10% when transmission oil temperature dropped from 44°C to 25°C. With the hubs free the decrease in fuel consumption was only 3% when the temperature decreased from 41°C to 29°C. Temperatures were measured using a sheathed metal thermocouple inserted in the axle level plug.

FITTING INSTRUCTIONS FOR LAND-ROVER MANUAL FREE-WHEELING HUB

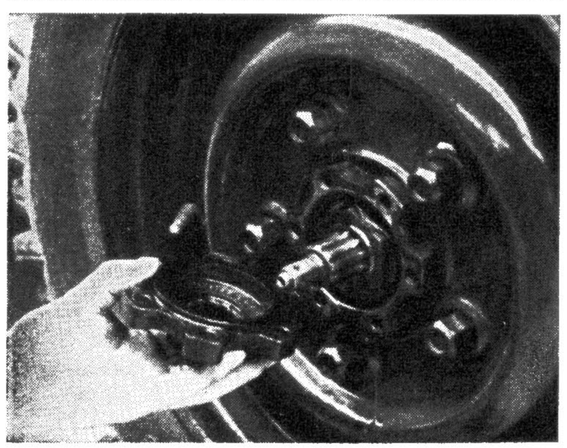
Please hand to customer after fitting for his careful perusal



1. Remove the oil cap covering the extension of the front stub axle.

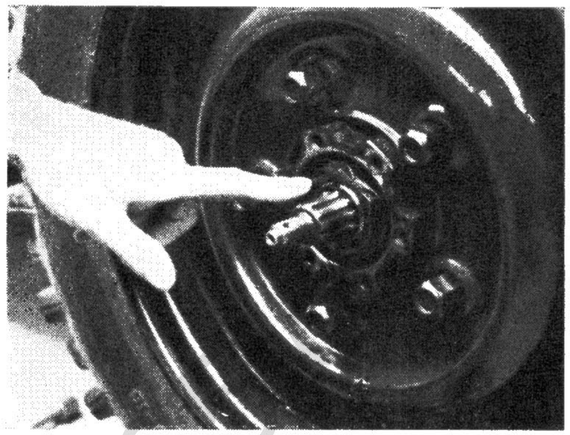


2. Remove the cotter pin securing the castellated nut on the extension of the stub axle.

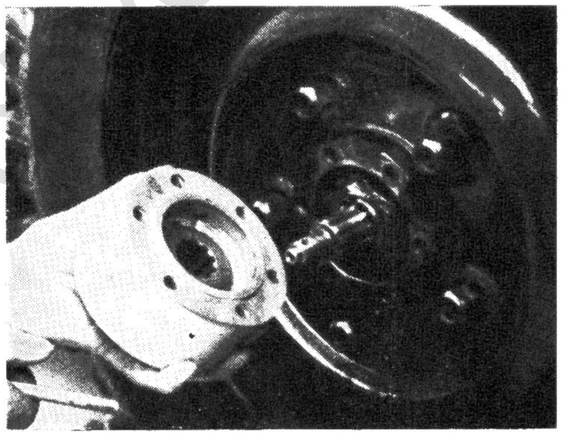


3. Remove the 6 bolts securing the driving "star" in position.

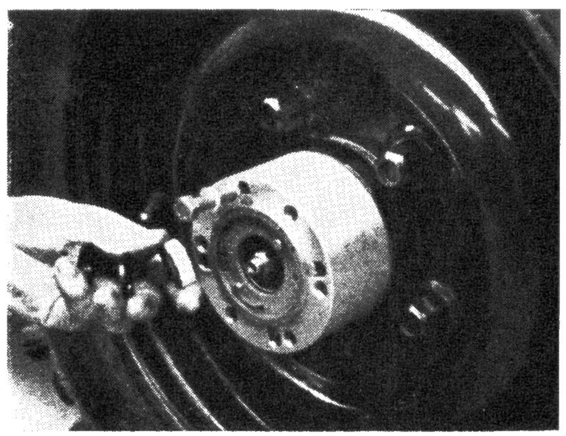
4. Remove the driving "star" **(this is not required but with the bolts should be retained in case the vehicle is sold and the Freewheeling Hubs removed).**



5. Jack up the vehicle at the front and check whether there is any end float on the wheel bearings. If so, correct before proceeding any further. (The Land-Rover Manual should be referred to — operation F16 in the Series 2 manual.) The end float is removed with inner hub nut and locknut. As a safeguard this should be checked again after locking the locknut in position.



6. Fix the new paper gasket to the flanged face of the free-wheeling hub main unit with jointing compound or grease. Check that the pawls are fully engaged. Locate the centre gear of the main unit on to the splined stub axle, push home and loosely screw in one bolt to hold it in position.



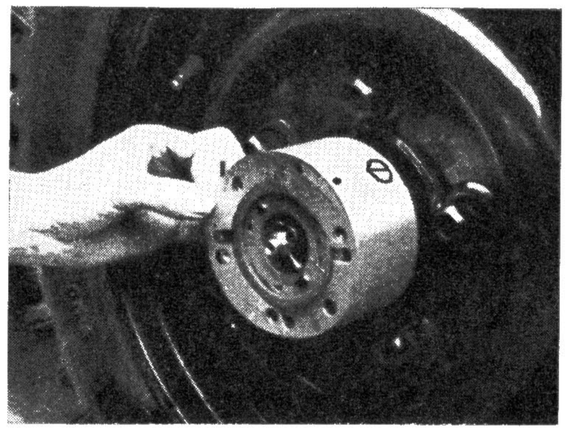
7. Fit the new rubber and felt oil seal with washer on the splined stub axle and screw on the original castellated nut. DO NOT OVERTIGHTEN, i.e., first tighten the nut and turn back to the nearest position for the cotter pin to be inserted and spread.

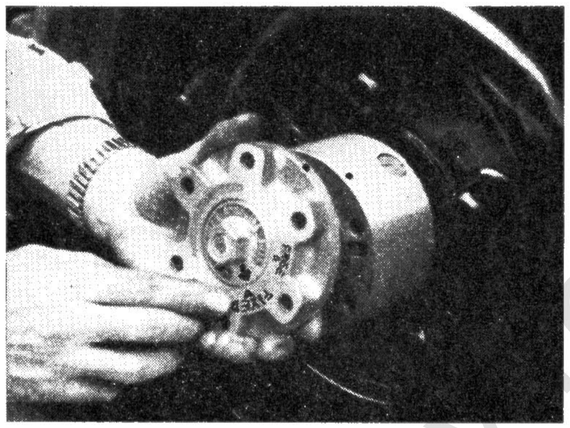
8. Fix the paper gasket in position on the body — make sure the slots in the gasket are in line with the pawl slots in the main body.

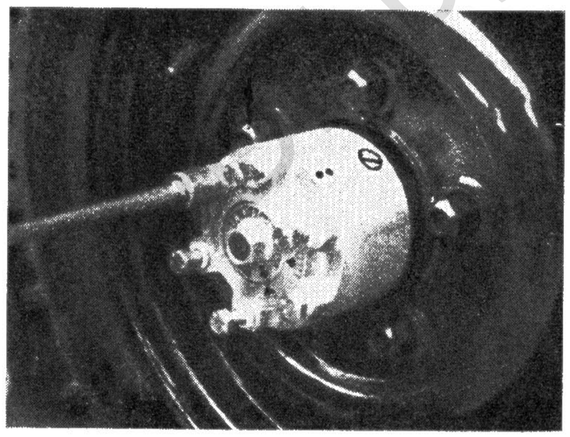
IMPORTANT

ENSURE THAT IF JOINTING COMPOUND IS USED IT DOES NOT EXUDE INTO THE MECHANISM OR FAULTY OPERATION WILL RESULT.

9. Pick up the cover assembly and check that the arrow points to fixed (as normally supplied and packed) if this is not so turn Hex: head with spanner until this position is reached. On the Hub body and cover there are two red dots, these dots must be placed adjacent to each other for final assembly (this is essential as the Hubs are manufactured with two recesses on the actuating disc, one smaller than the other, which fit pins of appropriate sizes on the lock cam, if this were not so arranged the Hubs could be assembled with "FREE" or "FIXED" in the wrong position). Screw in one bolt followed by the others and tighten in opposing pairs (This should be done with a torque spanner— 28 lbs. ft.).







10. The fitting is now complete and to check operation rotate the wheel by hand and verify that it is fixed to the transmission. Then turn the nut in the centre of the Hub to "F R E E" with the wheelbrace — (the action is designed to be somewhat stiff to avoid the possibility of oil or grease leaking) check that the wheel is free from the transmission. Set to fixed once more and rotate the wheel by hand slowly, after a few degrees of turn the pawls will be heard 'clicking" into position and the wheel will be once again fixed.

11. The Hubs are cleaned and greased at the factory. No further oil or grease is advised until you service your vehicle in the normal way.

12. Repeat the assembly instructions in respect of the other front wheel and the vehicle is ready for use.

13. Fasten transparent warning notice to windscreen.

a. **Hubs in "Free" position.** (Economy driving).
Do not engage four-wheel drive whilst vehicle is moving. Engagement will immediately accelerate the front transmission from rest to road speed and could cause damage. Because your front wheels are not connected to the transmission there is no point in selecting four-wheel drive; furthermore all the low ratio torque would be applied to the rear wheels only, possibly causing damage.

b. **Hubs in "Fixed" position.** (Four-wheel driving).
Your front wheels are connected to the transmission and as long as they are kept in the fixed position you can select four-wheel drive whenever required.

14. You should not attempt to dismantle the Hub as it is a sealed unit.

15. The Hubs require no maintenance apart from occasional grease or suitable oil in the same way as the standard vehicle.

16. **Note when the Hubs are set from FREE to FIXED turn the nut fully clockwise and then turn back until the arrows are correctly aligned, and make sure the vehicle is not run with only one hub fixed.**

17. Retain separate parts list for your future reference.

Manufactured by :

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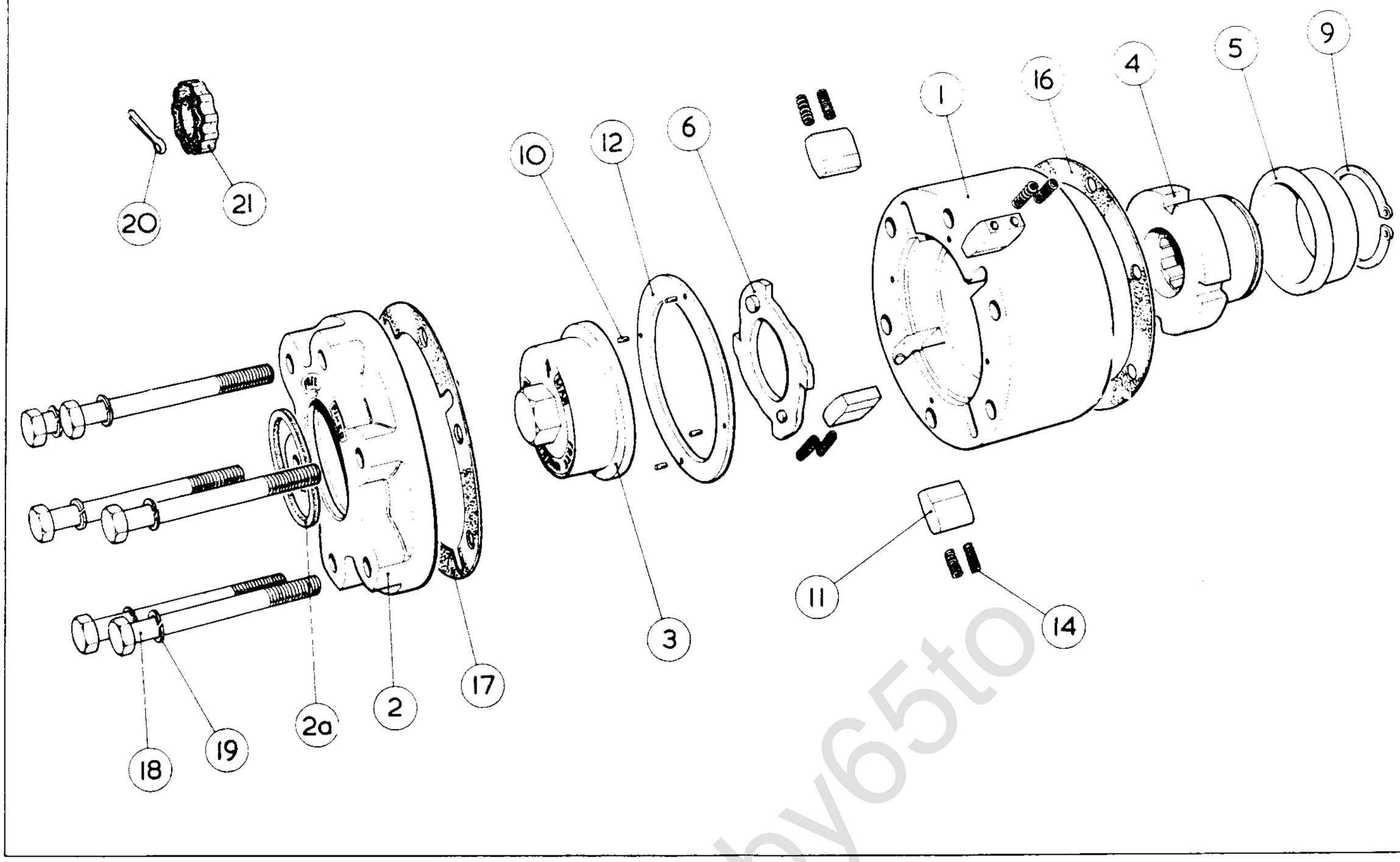
Telex 45324



PARTS LIST

FAIREY WINCHES LIMITED

LAND ROVER Freewheeling Hub

Part Number	
536603/1	Body Casting.
536603/2	Cover Casting.
536603/2a	Actuating Disc Dust and grease seal combined.
536603/3	Actuating Disc.
536603/4	Drive Gear.
536603/5	Drive Gear Bush.
536603/6	Lock Cam.
536603/9	Circlip.

Part Number	
536603/10	Drive Pins.
536603/11	Pawl.
536603/12	Pawl Retaining Ring.
536603/14	Pawl Spring.
536603/16	Rear Oil Gasket.
536603/17	Front Oil Gasket.
536603/18	Bolts.
536603/19	Spring Washers.
536603/20	Cotter Pin.
536603/21	Splined Seal.

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