

FIXED HUBS.

General. Recently there has been a resurgence of people asking for fixed wheel drive.

Over the years S.A. has produced fixed hubs but none has been available since the ASC went out of production in 1963.

The TF was a fixed two speed hub supplied from 1933 to 1941. It was offered in various guises, as a two speed hub alone or combined with a brake drum. The ratios were Direct Drive and -25%.

The TC was a fixed two speed hub from 1936 to 1941. It had closer ratios than the TF with Direct Drive and -13.46%.

The ASC was a fixed three speed hub from 1946 to 1963. The ratios were Direct Drive and -10% and -25%. It was based on the four speed FC.

To try to satisfy this desire for a fixed hub various hubs have been examined with a view to converting them to fixed drive.

The first point to make when planning a hub conversion is that only Direct Drive and a reduction ratio is possible.

Two Speed Fixed. This can be achieved using the AW, giving a Direct Drive and -25%. It is not a popular conversion and there is lost motion on both drives.

Three Speed Fixed. This is the usual conversion. Using the FM the ratios are Direct Drive and -14.3% and -33.3%.
Using the FW the ratios are Direct Drive and -21.1% and -33.3%.

Both these hubs have lost motion on the two reduction ratios when the standard Gear Ring with four splines is used. The correct Gear Ring, Part No. K.511B which was used with the ASC hubs has eight splines. If one of these can be found and fitted there is no lost motion on any of the gears.

To prevent the lost motion with these two hubs when the correct Gear Ring cannot be fitted I have designed a Clutch which can be fitted as a direct replacement of the standard four armed Clutch. More of this later.

The FG could be converted exactly the same as the FW except for the method of locking the Cage. The ratios would be the same as the FW.

With the FG the Cage drives the Shell via three axially located spring loaded Plungers 3/16" diameter engaging the left hand Ball Cup K404 which is fixed in the shell by four bolts. This Cup is hardened but if three of the ratchets could be ground deeper the plungers would engage in both directions and thus lock the Cage.

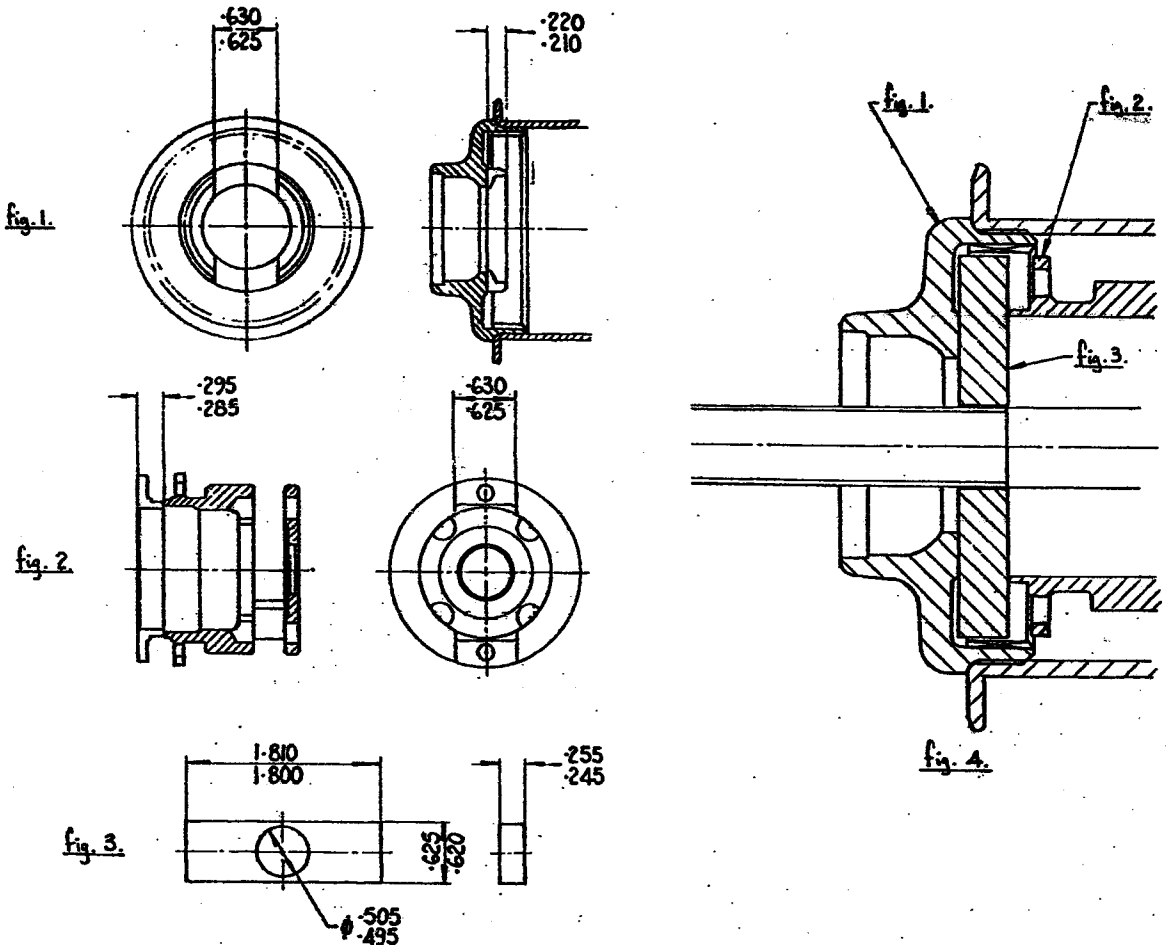
All the conversions require a post 1951 type Driver with three splines and a cir-clip.

AW Three Speed converted to Two Speed fixed.

S.A. issued drawings in 1981 showing how this conversion could be carried out.

The following instructions are to be read in conjunction with these S.A. drawings below.

1. All Pawls removed.
2. The conversion must be carried out on a hub dated later than 1962, when the pressed-in left hand Ball Cup was introduced.
3. Machine the left hand Ball Cup to take the Locking Bar. See fig 1.
I found that the only way I could grind this slot in the case hardened Ball Cup was to first press it out of the shell.
4. Before pressing out the left hand Ball Cup check that it has the inside flange which has to be slotted for the Locking Bar. I have seen a number of AW hubs that do not have this flange!
5. Grind the slot in the end of the Cage to suit the Locking Bar. See fig 2.
6. Before pressing the Ball Cup back into the Shell check that the items fit snugly.
7. Now to the drive end. No modification needs to be done, but with the standard Clutch and Gear Ring there will be lost motion on both gears.
8. The Clutch I designed for the FM and FW conversions could also be used for the AW conversion. Then there would be no lost motion in either gear.
9. The standard Trigger can be used without modification, "High" or "slack wire" is Direct Drive. The next two positions both give -25%.
10. There is a "No-Drive" position between Direct Drive and -25%.

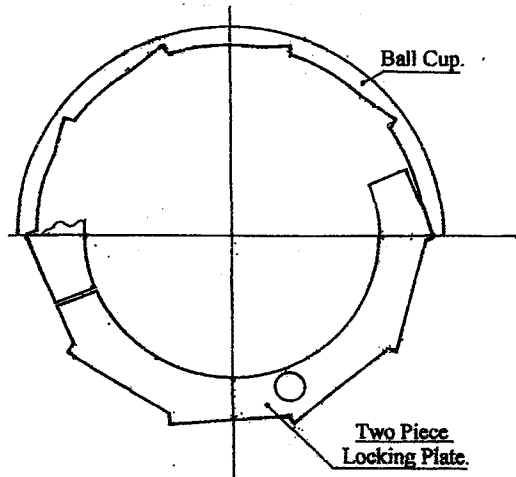


Copies of drawing supplied by Sturmey Archer. 1981.

FW four speed converted to 3 Speed Fixed. Direct Drive, -21.1% and -33.3%

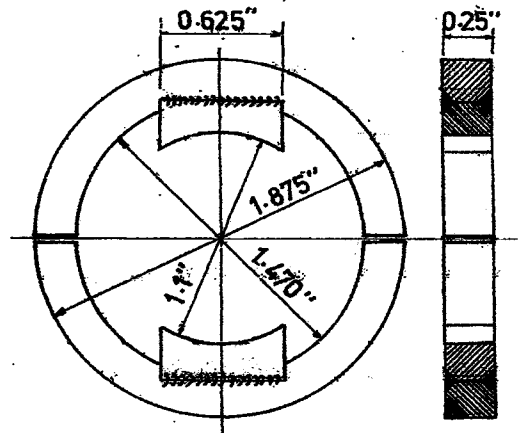
1. If the FW shell has a pressed-in left hand Ball Cup it can be used for the conversion. If it is earlier than 1962 with a screwed Ball Cup it will have to be discarded. It will probably be easier finding an AW shell with pressed-in Ball Cup.
2. Strip down the hub and replace the 30 tooth Sun Pinion (which will have ramped dogs) with a Pinion with square cut dogs. (After conversion the torque reaction of this sun pinion is in both directions!) A source for these square cut Pinions could be the early 5 speed hubs. They were also used in the standard FW when it was first introduced in 1946. Remove all Pawls.

3. Modify the K804 Indicator by adding a 3/16" long collar and machining 3/16" from the end. All as shown on the FM drawing.
4. The cage must be locked to the shell via the left hand Ball Cup. A locking device which can also be used on the AW is shown here. The two piece locking plate is designed to match the ratchet teeth of the Ball Cup. It must be case hardened and a very close fit. The advantage of this locking device is that there are no changes to make to the left hand Ball Cup or the Cage. However I think the relatively small teeth will wear very quickly. I would not like to hazard a guess as to its life expectancy.



First type Locking Plate for AW and FW Hubs.

5. The S.A. system with a Locking Bar as shown for the AW cannot be used with the FW because of the Dog Ring and its locknut.
6. I have therefore designed a Locking Plate utilising the slots shown for the AW but which clears the Dog Ring.
7. First the Ball Cup and the FW Cage are prepared as described for the AW. The split Locking Plate then replaces the Locking Bar of the AW. A ring is first machined from 1/4" plate then the two lugs are welded in position. The 1.1" diameter is machined before the ring is split. The two halves can then be fitted into the Pawl channel.
8. The modifications to the right hand end of the hub follows the description for the FM.
9. See notes under FM for Trigger details.
10. There will be lost motion on the two low gears.



Second type of Locking Plate for FW hubs.

FM four speed converted to 3 Speed Fixed. Direct Drive, -14.3% and -33.3%

This is the usual hub used for converting to three speed fixed.

1. Unscrew the left hand Ball Cup. This must have 10 slots for the ratchet drive.
2. If there is a lubricator in the left hand Ball Cup it is not suitable as this Ball Cup does not have the slotted drive.
3. The Indicator K804 should be modified as shown by the fitting of 3/16" long collar, and the machining of 3/16" from the end. This ensures that the low gear key starts to move at the second notch of the Trigger.
4. The Ball Cup from an AW shell should be pressed out and the Shell retained for use with the conversion.
5. All Pawls are removed.
6. Two Drive Dogs as shown on the attached exploded drawing should be made and fitted to replace the Pawls in the Cage. These Drive Dogs should be matched to the slots before the Ball Cup is pressed back into the AW shell.
7. The FM Ball Cup K817 is threaded so the crests of these threads need to be ground very slightly before this Ball Cup can be pressed into the AW Shell.
It must be a heavy press fit.

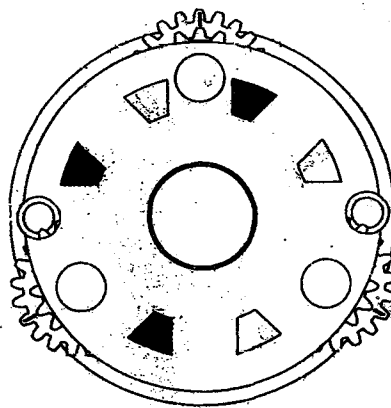
For guidance, the last hub I converted I found that a diameter over the threads of 2.150" produced the desired loading. However there could be slight variations in shell sizes so I would suggest the diameter over the serrations of the discarded AW Ball Cup should be checked first and used as a starting point.

8. The correct Gear Ring for use with Fixed hubs is K511B. which has 8 long splines to prevent lost motion, the standard Gear Ring K511 has four splines so that there is lost motion for the two lower ratios.

As the Gear Ring K511B is almost impossible to find we must accept this lost motion. Well not quite!

I have designed a Clutch (see attached sheet) which can be fitted directly to the existing Driver and which cuts out all lost motion. The Cage however requires three of the dogs to be removed, as shown on the diagram below.

9. The correct Triggers are virtually impossible to find. I have therefore shown on an attached sheet how a standard trigger can be modified to suit the steps required for fixed hubs.

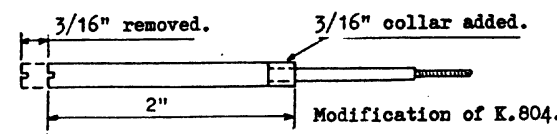
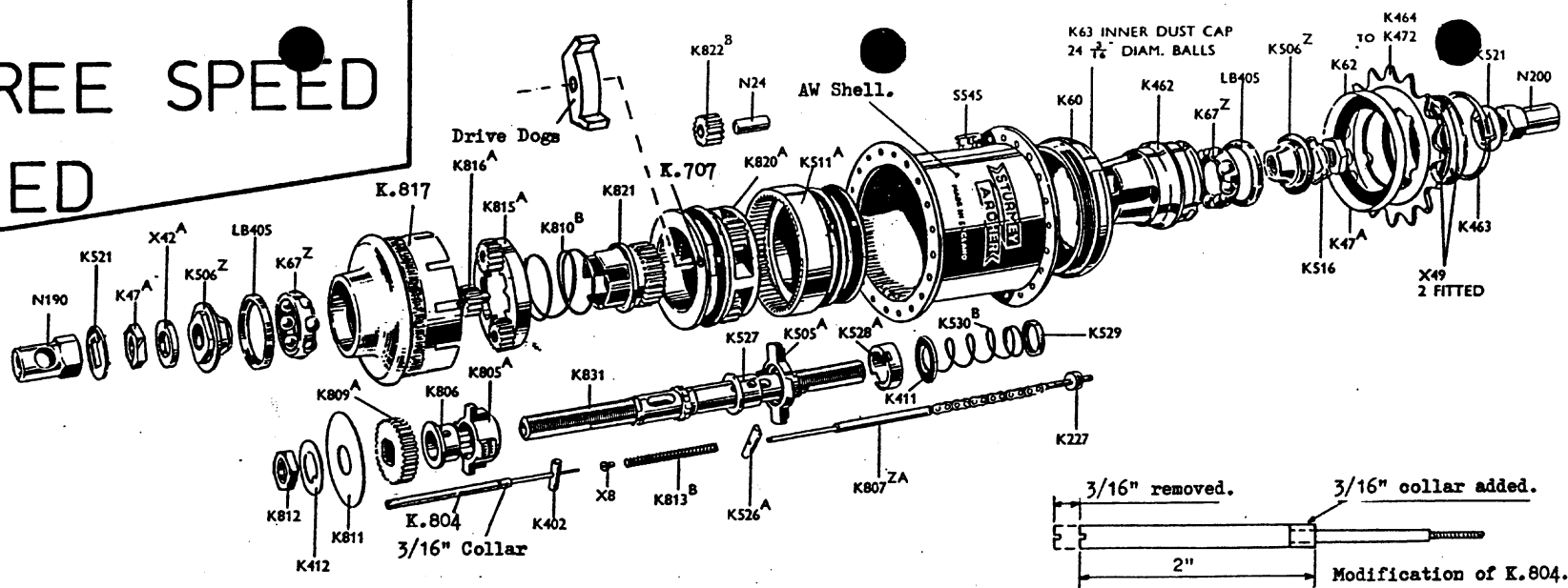


End view of Planet Cage showing Drive Dogs.

The shaded Dogs are to be removed to suit the new Clutch.

Diagram based on FW Planet Cage.

THREE SPEED FIXED



CODE No.

DESCRIPTION

K831	Axle, 5 $\frac{1}{2}$ " long
K805A	Low Gear Dog
K806	Dog Sleeve
K402	Low Gear Key
K809A	Secondary Sun Pinion 30t
K811	Locating Plate
K412	Locking Washer
K812	Locknut
K815A	Secondary Planet Cage
K816A	Secondary Planet Pinion 14t
K810B	Low Gear Spring
K821	Primary Sun Pinion 30t
K820A	Planet Cage
K707	Pin for Drive Dogs
K822B	Planet Pinion 14t
N24	Pinion Pin
K804	Indicator plus 3/16" long collar, equivalent to K.716
X8	Collar for Compensator Spring
K813B	Compensator Spring
K527	Clutch Sleeve
K505A	Sliding Clutch
K526A	Axle Key
K807ZA	Coupling complete
K807Z	Coupling complete, quick-release type. <i>Not illustrated</i>
K227	Connection Locknut
K528A	Thrust Ring
K411	Thrust Washer
K530B	Clutch Spring
K529	Spring Cap
K511A	Gear Ring 60t. Correct ring is K.511B. (This has eight long splines.)

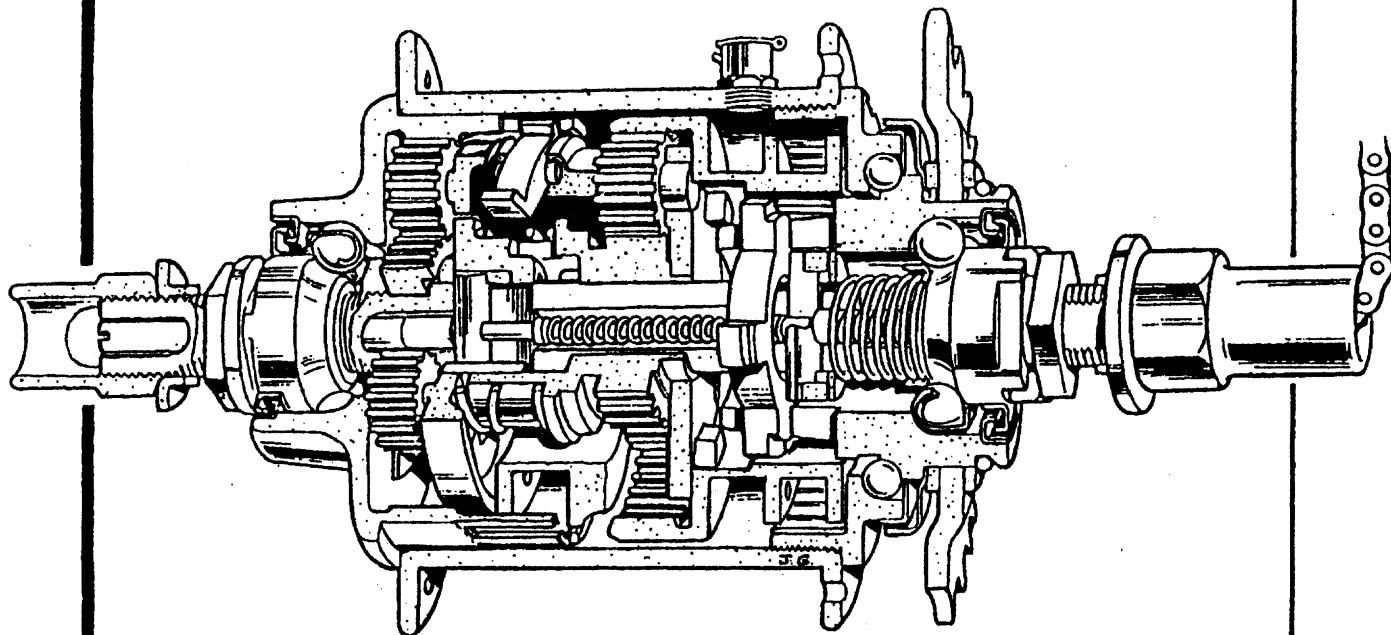
CODE No.

DESCRIPTION

K60	R.H. Ball Ring
329	Ball Bearings, $\frac{1}{4}$ " diam. (per set of 24)
K63	Inner Dust Cap
K67Z	Ball Cage with 8 $\frac{1}{4}$ " diam. balls-
LB405	Outer Dust Cap
K506Z	Axle Cone with Dust Cap
K516	R.H. Cone Locking Washer
	Shell, Post 1962 type with L.H. Cup pressed out
S545	Lubricator
K817	Ball Cup 60t * Pressed into AW shell.
K228	R.H. Ball Ring } Alternative to K60 and 329 for
K230Z	Ball Cage with balls } 14T and 15T sprockets. <i>Not</i>
X42A	Axle Spacing Washer $\frac{1}{4}$ " thick } <i>illustrated</i>
K47A	Cone Locknut
K521	Axle Locking Washer
N190	L.H. Axle Nut
N200	R.H. Axle Nut
K62	Sprocket Dust Cap
K464	Sprocket, 14 teeth
K465	Sprocket, 15 teeth
K466	Sprocket, 16 teeth
K467	Sprocket, 17 teeth
K468	Sprocket, 18 teeth
K469	Sprocket, 19 teeth
K470	Sprocket, 20 teeth
K472	Sprocket, 22 teeth
X49	Sprocket Spacing Washer
K463	Circlip
K229	Sprocket Dust Cap when K228 used. <i>Not illustrated</i>

* Threads must be carefully ground down until a heavy press fit is obtained.

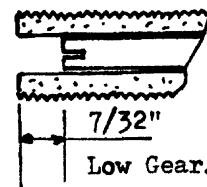
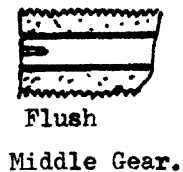
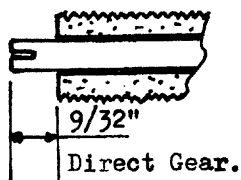
THREE SPEED FIXED



THREE SPEED FIXED. BASED ON FM. HUB.

RATIOS - Direct, -14% -33%

CONVERSION By J.GILL.1990.



To be set up in Middle Gear, but check that indicator moves the full 7/32" when in Low Gear.
 Note: The standard AW trigger moves 9/32" and 3/16" so must be modified for the above fixed hub.

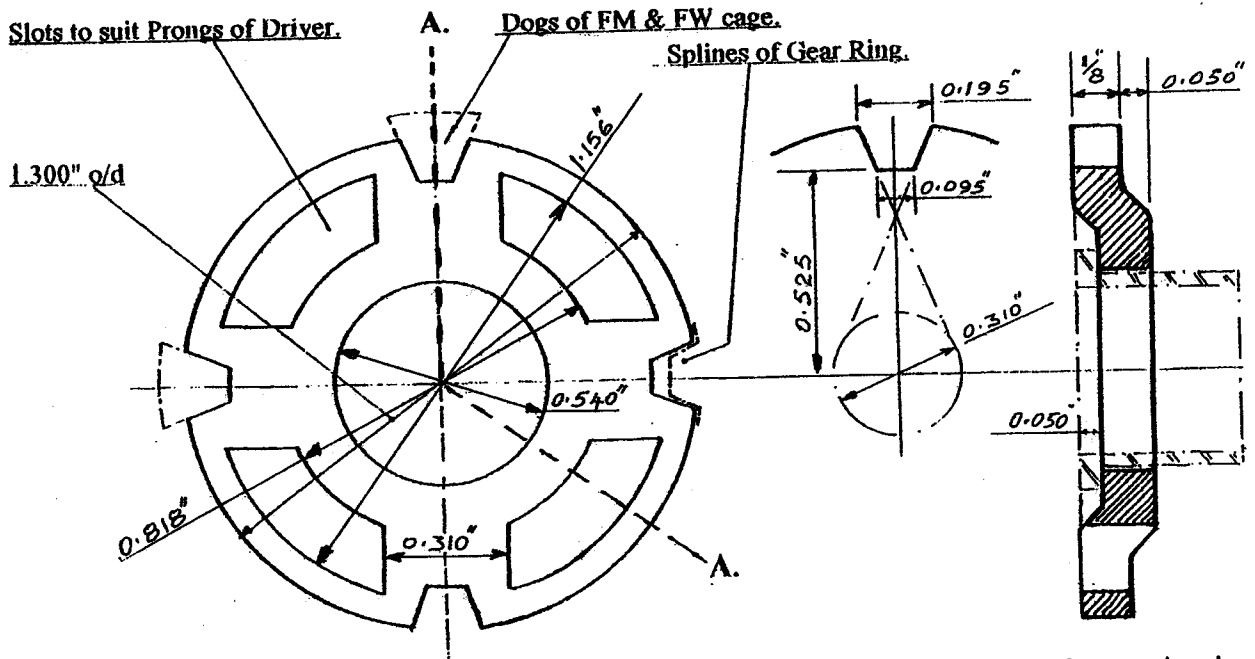
DESIGN OF CLUTCH FOR FITTING TO FIXED CONVERSIONS.

When converting the FM or FW to fixed three speed hub there is a problem of lost motion in the two lower gears when a standard Gear Ring is used. This Ring has only four splines whereas the correct Gear Ring for fixed hubs - part no. K511B - has eight splines.

To enable a standard Gear Ring to be used I have designed a new Clutch which is a direct replacement for the standard Clutch and which does not give any lost motion when used with the standard Gear Ring with four splines.

To take this new Clutch three of the six dogs on the Planet Cage must be ground off. The remaining three dogs must match the outer slots of the Clutch.

The Clutch would be pressed from 1/8" steel plate, flanged to give the 0.050" recess for the collar of the Sleeve, then case hardened.



Twice Full Size

Section on A - A

End view of Planet Cage showing Drive Dogs.

The shaded Dogs are to be removed to suit the new Clutch.

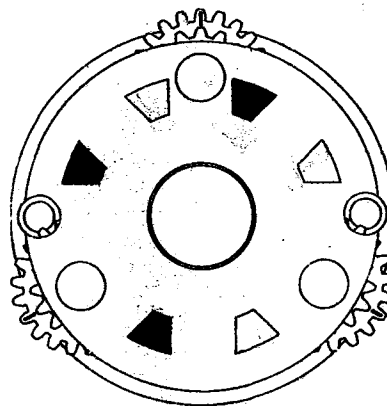


Diagram based on FW Planet Cage.

TRIGGER CONTROL for ASC HUBS and other FIXED CONVERSIONS.

The standard 3 speed hub requires an Indicator movement of $9/32$ " and $3/16$ ". The Ratchet Plate of the Trigger Control for these hubs has the notches cut to suit this movement.

The ASC hubs require an Indicator movement of $9/32$ " and $7/32$ ". As the correct control, (GC2A.), is virtually impossible to find, some means of modifying the AW type controls would seem to be the best solution. With this in mind I have stripped and attempted to modify each of the various controls issued since 1938.

I have found that the only ones that can be modified relatively easily are the models using the large Spring K.738 and Pawl K.722. See diagram below.

