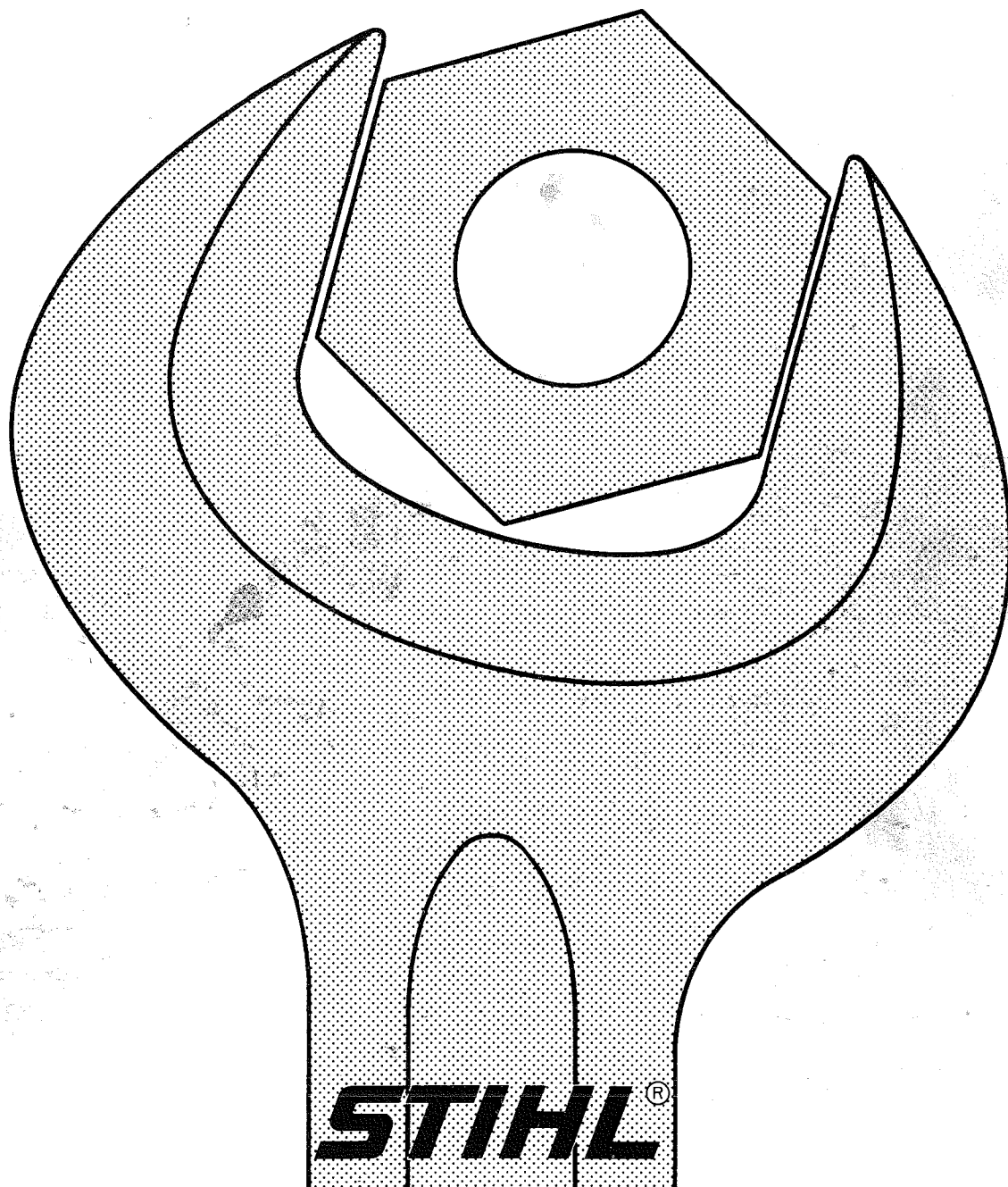


STIHL 028, 038



SERVICE MANUAL 028/038

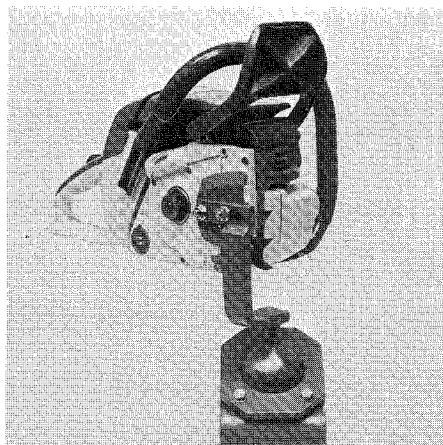
FOREWORD

This Service Manual covers model 028 chain saws up to machine number 5561640 as well as later machines unless technical information bulletins have been issued in the meantime with updated repair procedures.

Models 038 have substantially the same constructional features as model 028 chain saws. This Service Manual can therefore be used for the 038 chain saws as well.

In the event of faults it is quite possible that a **single malfunction may have several causes**. It is, therefore, advisable to consult the "troubleshooting charts" when tracing faults. We also recommend that you make use of the exploded views in the illustrated parts lists while carrying out repair work.

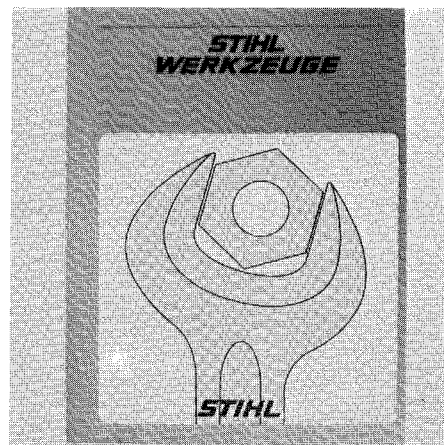
This service manual and all technical information bulletins are intended exclusively for the use of STIHL servicing staff and dealers and must not be passed on to third parties.



Repair work is made considerably easier if the chain saw is mounted on assembly stand 5910 8503100. The saw is easily attached to the stand by means of the two stud bolts and collar nuts for bar mounting.

While on the assembly stand, the chain saw can be swivelled into any required position to suit the repair in question. This not only has the advantage of keeping the component in the best position for the repair, but also leaves both hands free for the work, and thus represents a considerable time-saving.

SPECIAL TOOL MANUAL



Our special tool manual illustrates and lists the part numbers of all available machine-related tools as well as general purpose tools for all machines.

The special tool manual is available in various languages and can be ordered by quoting the appropriate part number listed hereunder.

| | |
|------------|---------------|
| German | 0455 901 0023 |
| English | 0455 901 0123 |
| French | 0455 901 0223 |
| Spanish | 0455 901 0323 |
| Yugoslav | 0455 901 0423 |
| Swedish | 0455 901 0523 |
| Italian | 0455 901 0723 |
| Portuguese | 0455 901 1223 |

STIHL® Andreas Stihl
Postfach 1760
D-7050 Waiblingen

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1. SPECIFICATIONS

1.1 Engine

| | |
|---|---|
| | STIHL single cylinder, two-stroke engine with special impregnated cylinder bore |
| Displacement: | 47 cm ³ (2.87 cu. in) |
| Bore: | 44 mm (1.73 in) |
| Stroke: | 31 mm (1.22 in) |
| Compression ratio: | 9.5:1 |
| Max. torque: | 2.65 Nm (1.95 lbf. ft) at 6000 rpm |
| Max. permissible engine speed: | 12000 rpm |
| Mean idle speed: | 2200 rpm |
| Crankshaft: | Two-part, drop-forged |
| Crankshaft bearings: | 2 deep-groove ball bearings |
| Crankpin: | 14.4 mm (0.57 in) dia. |
| Big-end bearing: | Needle cage |
| Piston pin: | 10.0 mm (0.39 in) dia. |
| Small-end bearing: | Needle cage |
| Rewind starter: | Pawl engagement with automatic starter rope rewind mechanism |
| Starter rope: | 3.5 mm (0.14 in) dia., 1060 mm (41.8 in) long |
| Clutch: | Centrifugal clutch without linings, 76 mm (3 in) dia. |
| Clutch engages at: | Approx. 3100 rpm |
| Crankcase leakage test: with overpressure: | $p_{\bar{u}} = 0.5 \text{ bar (7.1 lbf/in}^2\text{)}$ |
| with vacuum: | $p_{\bar{u}} = 0.5 \text{ bar (7.1 lbf/in}^2\text{)}$ |

1.2 Fuel System

| | |
|---|--|
| Carburetor: | All-position diaphragm carburetor with integral fuel pump |
| Adjustment: | |
| high-speed adjustment screw H: | Open approx. 1/4 turns |
| low-speed adjustment screw L: | Open approx. 1/4 turns (basic setting with screws initially hard against their seats) |
| Carburetor leakage test with overpressure: | $p_{\bar{u}} = 0.4 \text{ bar (5.7 lbf/in}^2\text{)}$ |
| Fuel capacity: | 0.52 L (1.1 U.S.pt) |

| | |
|---------------|--|
| Fuel mixture: | Fuel mix 1:40 with STIHL two-cycle engine oil; 1:25 for other branded two-cycle engine oils |
| Air filter: | Flat wire mesh filter |

1.3 Ignition System

028 AV and 028 AVQ

| | |
|-------------------------|--|
| Type: | Breaker-controlled magneto ignition system |
| Magneto edge gap: | 4 ... 8 mm (0.16 ... 0.31 in) |
| Air gap: | 0.2 ... 0.3 mm (0.008 ... 0.012 in) |
| Ignition timing: | 2.2 ... 2.3 mm (0.087 ... 0.091 in) before T.D.C. |
| Ignition advance angle: | 27 ... 28° |
| Breaker point gap: | 0.35 ... 0.4 mm (0.014 ... 0.016 in) |
| Condenser: | Capacitance 0.15 ... 0.19 μ F |
| Armature: | Coil resistors |
| | Primary Secondary |
| | 0.7 ... 1.0 Ω 7.7 ... 10.3 k Ω |

028 AVE

| | |
|-------------------------|--|
| Type: | Transistor-controlled (breaker- less) magneto ignition system |
| Air gap: | 0.2 ... 0.3 mm (0.008 ... 0.012 in) |
| Ignition timing: | 2.6 mm (0.1 in) before T.D.C. at 8000 rpm |
| Ignition advance angle: | 30° at 8000 rpm |
| Armature: | as 028 AV/028 AVQ |

028 AVEQ

| | |
|------------------|---|
| Type: | Thyristor-controlled (breaker- less) magneto ignition system |
| Air gap: | 0.2 ... 0.3 mm (0.008 ... 0.012 in) |
| Ignition timing: | 2.6 mm (0.1 in) before T.D.C. at 8000 rpm |

All Models

| | |
|--------------------------|---|
| Spark plug (suppressed): | Bosch WSR 6 F or Champion RCJ 6 Y Heat range: 200 |
| Spark plug thread: | Electrode gap: 0.5 mm (0.02 in) M 14 x 1.25; 9.5 mm (0.37 in) long |

1.4 Tightening Torques

| | |
|--|----------------------|
| Crankshaft nut (ignition side) M 8 x 1: | 30 Nm (22 lbf. ft) |
| Hub/spider (output side): | 50 Nm (37 lbf. ft) |
| M 5 socket head screws: | 8 Nm (6 lbf. ft) |
| M 5 cheese-head screws: | 5 Nm (3.7 lbf. ft) |
| M 4 cheese-head screws: | 2.5 Nm (1.8 lbf. ft) |
| M 5 nuts: | 5 Nm (3.7 lbf. ft) |
| Spark plug: | 25 Nm (18.4 lbf. ft) |

Important: The M 5 x 12 screws on the front handguard and the M 4 x 8 screws on the spider are fitted with LOCTITE.

1.5 Cutting Attachment

| | |
|--------------------|---|
| Guide bars: | STIHL Duromatic guide bars with stellite-tipped bar nose; STIHL Rollomatic guide bars with sprocket nose. Both types with corrosion resistant finish and induction hardened track |
| Bar lengths: | Duromatic 40 and 45 cm (16 and 18 in) Rollomatic 32, 37, 40 and 45 cm (13, 14.6, 16 and 18 in) |
| Chain: | 0.325" (8.25 mm) pitch |
| Chain sprocket: | 7-tooth for 0.325" chain |
| Chain speed: | 16.4 m/s (53.8 ft/sec) at 8500 rpm |
| Chain lubrication: | Speed-controlled oil pump with lift plunger, operative only when chain is running |
| Oil delivery rate: | 8 cm ³ /min (0.49 cu. in/min) at 6000 rpm |
| Oil tank capacity: | 0.3 L (0.63 U.S.pt) |

1.6 Weights

| Model: | AV/AVE | AVQ/AVEQ |
|--------------------------------------|------------------|------------------|
| Dry weight with 32 cm bar and chain: | 6.5 kg (14.3 lb) | 6.6 kg (14.5 lb) |

1.7 Special Accessories

| | |
|----------------------|---------------|
| STIHL rescue kit 028 | 1118 900 5000 |
| Gasket set 028 | 1118 007 1050 |

2. CLUTCH, CHAIN DRIVE AND CHAIN BRAKE

2.1 Construction and Operation

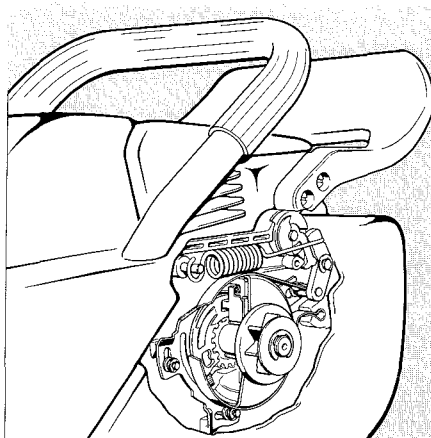
2.1.1 Clutch and Chain Sprocket

The transmission of power from the engine to the saw chain is effected via a centrifugal clutch. On "Quick-stop" models, the centrifugal clutch incorporates an isolating clutch which is actuated by the chain brake.

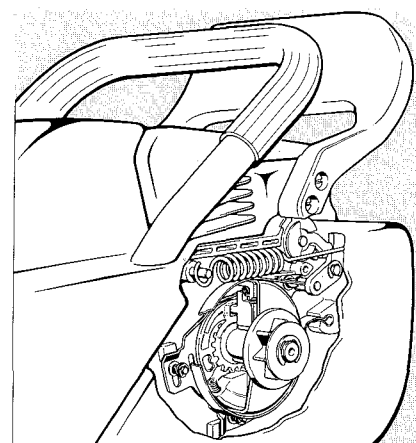
On the **Quickstop version** the hub screwed to the crankshaft is the clutch element which absorbs the torque and acceleration of the crankshaft. It is essential that the hub is always tightened down to the specified torque. The clutch spider is supported on the hub by a needle sleeve and located axially with a circlip. The driving plate is located on the three lugs of the clutch spider and can move axially while remaining in constant mesh with the spider. The flat spring between the spider and driving plate presses the driving plate against the release plate; this means that the internal teeth of the driving plate are always in mesh with the teeth of the hub when the chain brake is released, and thus provides positive transmission of engine torque to the clutch spider. When the chain brake is actuated, the release plate disengages the driving plate from the hub. The clutch spider and hub can then rotate independently.

On the **standard version** the clutch spider assumes the function of the hub and must therefore always be tightened to the specified torque.

Chain brake engaged



Chain brake released



The centrifugal clutch has three clutch shoes without linings. The clutch drum and chain sprocket are separate components. The spur gear which drives the oil pump is a ring-gear, positively mounted to the hub of the clutch drum. The chain sprocket has two integrally cast lugs which engage in corresponding recesses on the drum hub. As the lugs have odd sizes, the chain sprocket can only be fitted in one position.

When the engine is running at idle speed the clutch shoes are also in the idle position, because the tension of the clutch spring is greater than the centrifugal force. As engine speed increases, centrifugal force presses the clutch shoes outwards against the clutch drum and thus transmit engine torque positively via the chain sprocket to the saw chain.

The preload and strength of the clutch spring are designed so that

the clutch shoes begin to make contact with the clutch drum at an engine speed of approx. 3100 rpm (engagement speed). The clutch engages fully above this speed. The correct idle setting on the carburetor is therefore essential in order to insure that the clutch engagement speed is not reached when the engine is idling.

2.1.2 Chain Brake

The chain brake is a spring-loaded band brake without linings. Its main components are the brake band, tension spring, handguard and release plate – which operates the isolating clutch.

The chain brake is actuated by means of the handguard which can be used to release and engage the brake.

The **chain brake is released (reset)** by pulling the handguard back against the handlebar. This movement is transmitted via a lever system which preloads the tension spring and disengages the brake band. At the same time the release plate moves back and allows the driving plate to engage in the teeth of the hub. The brake lever, which is connected to the tension spring, brake band and release plate, is locked in the idle position by the relay lever.

The **chain brake is actuated** by moving the handguard towards the bar nose. This movement unlatches the brake lever and causes the brake band to be clamped around the clutch drum by the force of the preloaded brake spring. The release plate simultaneously disengages the driving plate from the hub and interrupts the flow of power between the crankshaft and the centrifugal clutch. Clutch drum and saw chain are brought to a standstill within a fraction of a second even if the engine continues running at high speed.

2.2 Troubleshooting Chart

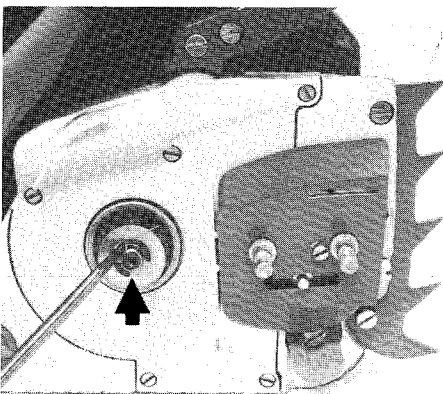
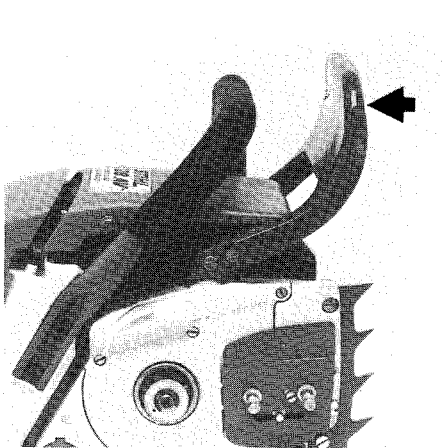
| Fault | Cause | Remedy |
|---|--|---|
| Saw chain turns at idle speed | Engine idle speed too high | Readjust at idle speed adjustment screw |
| | Clutch spring stretched or fatigued, spring hooks broken | Renew clutch spring |
| Excessive chain sprocket wear | Incorrect chain tension | Tension saw chain properly |
| Chain stops in mid-cut even with engine at maximum speed – Isolating clutch disengages during cutting | Isolating clutch worn | Renew hub and driving plate |
| | Flat spring broken | Renew flat spring |
| Isolating clutch does not re-engage after releasing chain brake | Engine idle speed too high | Readjust at idle speed adjustment screw |
| | Flat spring broken | Renew flat spring |
| Saw chain does not stop immediately when chain brake is engaged | Tension spring broken | Renew tension spring |

2.3 Disassembly and Repair

2.3.1 Clutch

Top:
Chain brake released

Bottom:
Pressing out the retaining washer



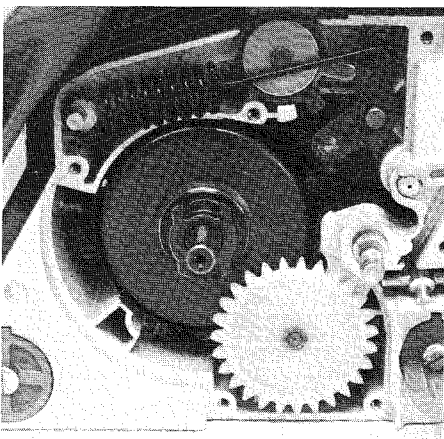
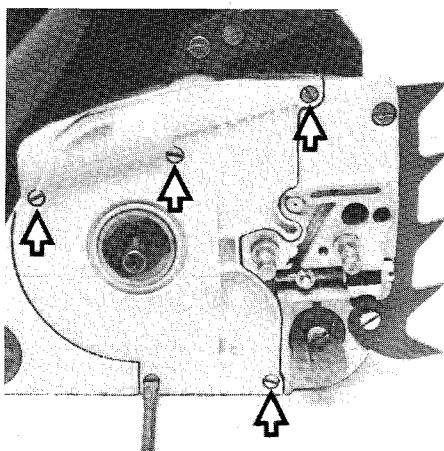
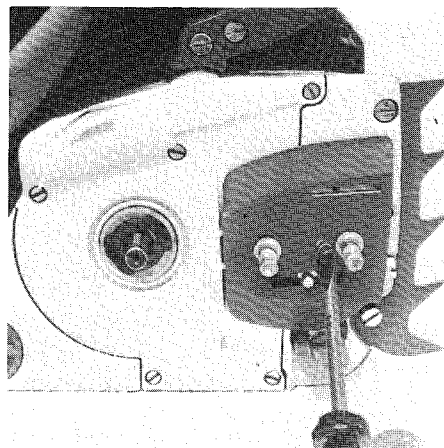
First remove chain sprocket cover and cutting attachment.

The chain brake must be released before removing the chain sprocket. Use a screwdriver, about 5 mm wide, to press the retaining washer out of the annular groove in the crankshaft. The thrust washer, chain sprocket and needle sleeve can now be pulled off the crankshaft.

Top:
Removing the side plate

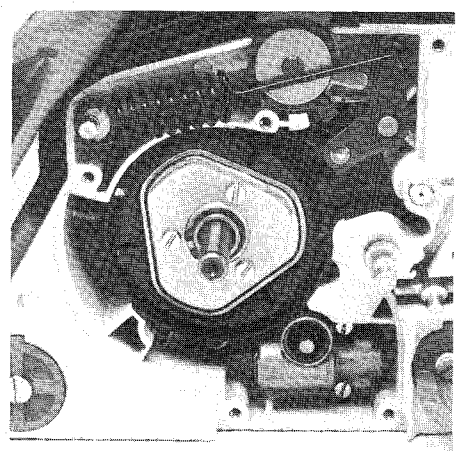
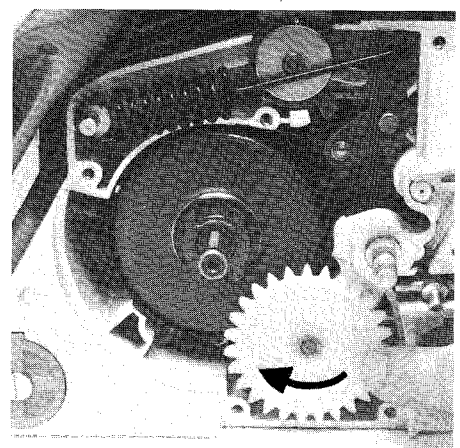
Center:
Releasing the cover

Bottom:
Ring-gear removed



Top:
Removing the spur gear

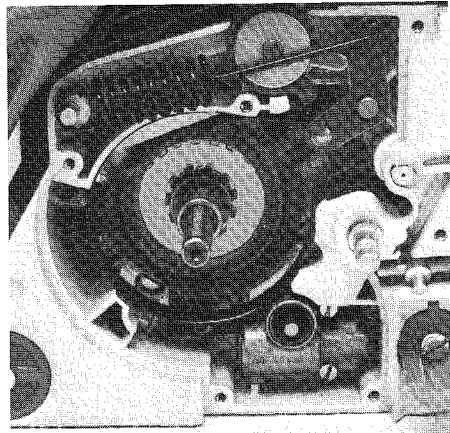
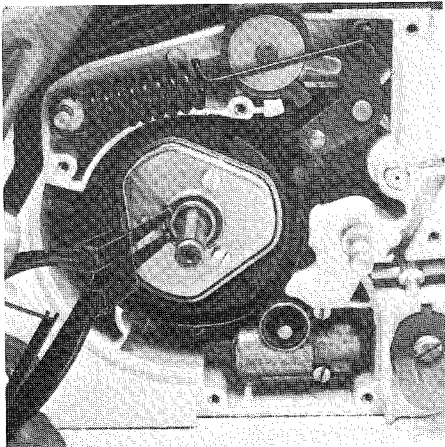
Bottom:
Clutch drum and needle sleeve removed



Remove the inner side plate – secured with a single M 4 x 12 cheese-head screw. Unscrew the five M 4 x 12 cheese-head screws and take off the cover. Now remove ring gear from clutch drum hub and the spur gear (with worm) from the oil pump shaft by turning it clockwise. Pull clutch drum and needle sleeve off the crankshaft.

Top:
Removing the circlip

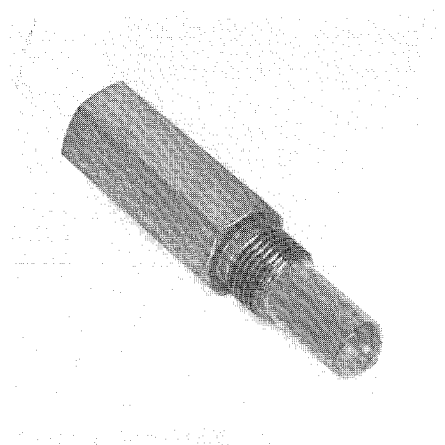
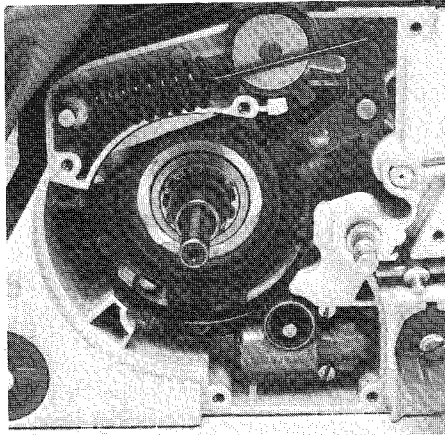
Bottom:
Clutch, flat spring and needle sleeve removed



Top:
Driving plate removed

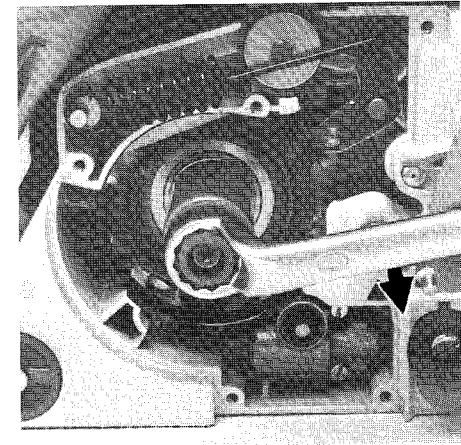
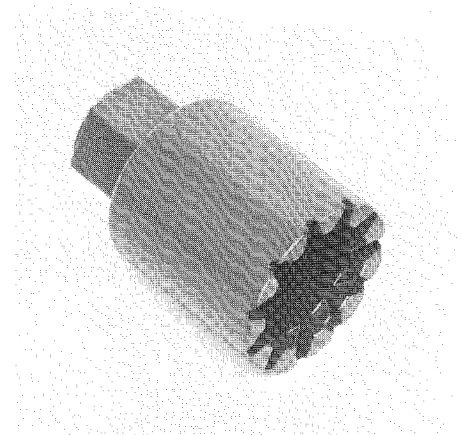
Center:
Locking screw 1107 191 1200

Bottom:
Locking screw inserted



Top:
Special socket 1118 893 1300

Bottom:
Unscrewing the hub

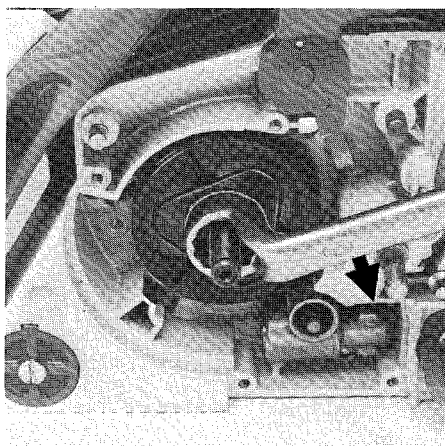


Disassembly differs on the Quickstop and standard versions from this stage onwards.

On the **Quickstop version**, first remove the circlip which locates the clutch spider on the hub. The clutch with flat spring and needle sleeve can now be pulled off the hub. If the hub has to be removed, first remove the driving plate and block the crankshaft. To do this, unscrew

spark plug and fit locking screw 1107 191 1200 in the spark plug hole and tighten down by hand. Use special socket 1118 893 1300 to unscrew the hub. Remove washer from behind hub.

Unscrewing the clutch spider

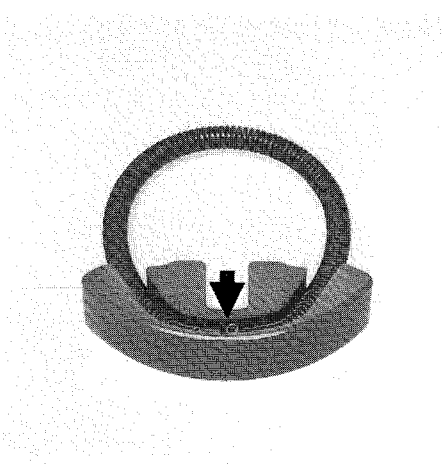
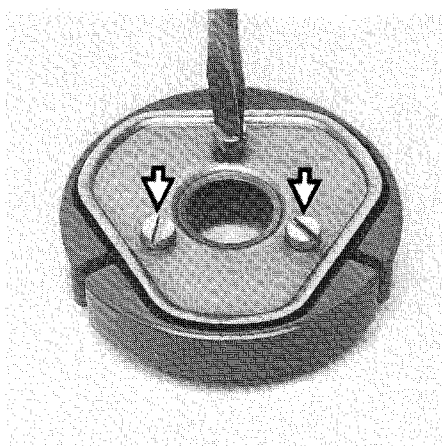


The crankshaft must also be blocked with locking screw 1107 191 1200 in order to remove the clutch spider on the **standard version**. Use a 19 mm cranked ring wrench to unscrew the clutch spider and then remove the dished cover plate.

Caution: The hub and clutch spider have left-hand threads – unscrew them clockwise.

Wash all parts of the clutch, including the needle cages, in clean gasoline and blow out with compressed air if available. Also clean crankshaft stub.

Always replace damaged or worn parts.

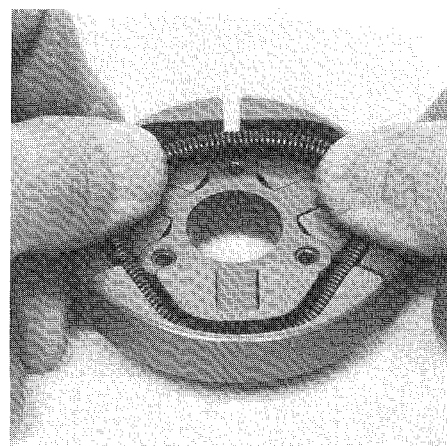
Top:
Removing cover plateBottom:
Clutch spring in spring recess

Use the following procedure to replace the clutch spring, clutch shoes or spider:

First unscrew the cover plate from the spider (Quickstop only) and then remove the clutch shoes.

To assemble the clutch, first position the clutch spring in the spring recess of one clutch shoe, so that the spring

Pressing clutch spring into position

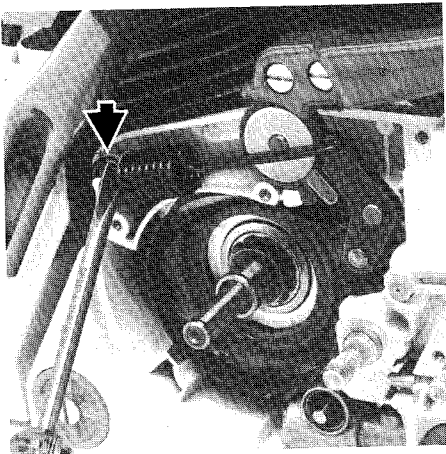


hooks are in the center of the clutch shoe. Now fit the three clutch shoes on the arms of the spider so that the spring recesses face away from the triangular plate on the spider. Grip the clutch spring with both thumbs and push it into the spring recesses of the other two clutch shoes.

Refit the cover plate on the Quickstop clutch. The three M 4 x 8 cheese-head screws must be secured with LOCTITE.

2.3.2 Chain Brake

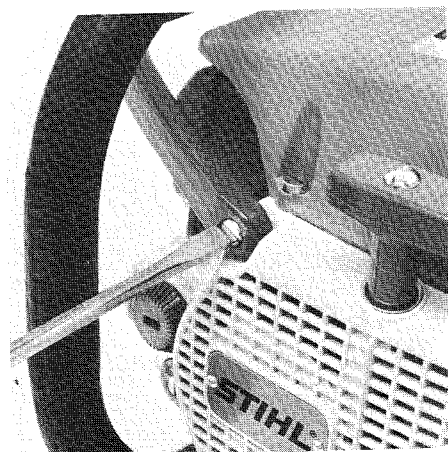
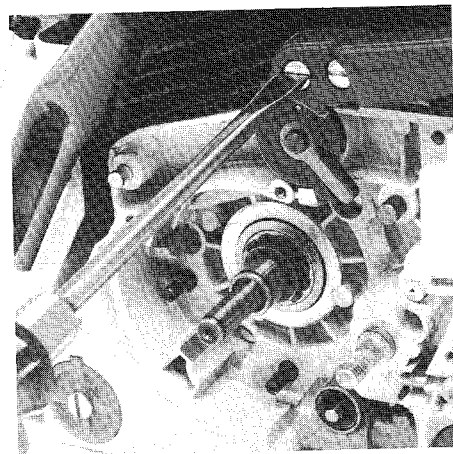
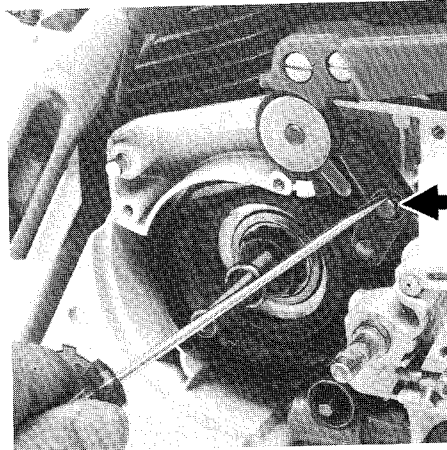
Detaching the tension spring



The clutch drum must be removed before the brake band can be disassembled. To do this, engage the chain brake and detach the tension spring. Remove retaining washer from brake lever's pivot pin and carefully withdraw the brake lever. Collect the washers and helical spring on the brake band's pivot pin. The other end of the brake band can now be prised out of its seat in the crankcase.

Take out the clutch before removing the release plate. Remove the retaining washers, washers and helical springs from the guide pins and take the release plate out of the crankcase.

Unscrew the handguard (the cheese-head screws will be difficult to remove because they are fitted with LOCTITE) and then take out the actuating lever, relay lever and torsion spring.

Top:
Removing retaining washerCenter and Bottom:
Unscrewing the handguard

The spring guide pins in the crankcase must be replaced if they are damaged.

These screw pins must be bonded in position to prevent them loosening in operation. To do this, use a suitable solution (trichlorethylene, diluted nitro or similar) to completely degrease the threads in the crankcase and on the pins themselves. Then coat the threads of the screw pins with a little adhesive – 101, part number 0786 111 1101, (LOCTITE 242) – and screw them into the crankcase. Tighten to a torque of 4.9 Nm (0.5 kpm).

It is essential to use a suitable screwdriver with a tip which fits snugly in the slot of the pin in order to avoid damaging the pin material. A 1 x 6.5 screwdriver in accordance with DIN 5265 is recommended for this purpose.



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