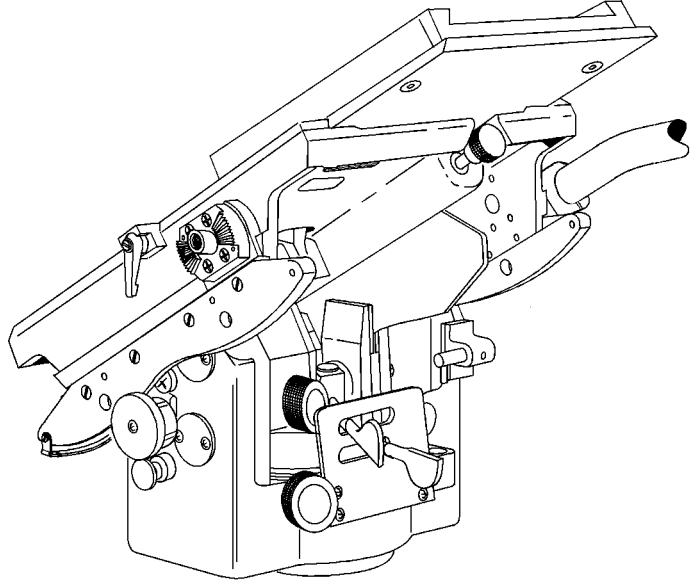


# Maintenance Manual

## Mk 7B



# LF Cam Head



# **MK 7B**

## **LF CAM HEAD**

**3388**

### **MAINTENANCE MANUAL AND ILLUSTRATED PARTS LIST**

**PUBLICATION PART No. 3388-9**

**Issue 2**

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## Foreword

This manual provides full and detailed maintenance and spare parts information for the Vinten® Mk 7B LF Cam Head. The Mk 7B LF Cam Head is an obsolete product and this Maintenance Manual is provide for the final production version.



**WARNING!:** Read the Safety Section on [page 5](#) before using this head or attempting any adjustment or repair.

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It is recommended that this manual is read carefully and the illustrations studied prior to operating or servicing the head. Attention to the details contained herein will ensure that the head will operate efficiently with the minimum of attention over a long service life. Particular attention must be paid to cleaning, especially after use in adverse conditions.

To order spare parts or to obtain further information, application should be made to Vinten Broadcast Limited or to your local distributor, or visit our website at [www.vinten.com](http://www.vinten.com).

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## Notes to readers

This is an on-line version of 'Mk 7B LF Cam Head Maintenance Manual' (3388-9). The Mk 7B LF Cam Head is an obsolete product and this Maintenance Manual is provide for the final production version.

## Navigation

Clicking the mouse on any [blue text](#) will move you around the document. For example, if you click on one of the blue call-outs on an exploded drawing, you will be taken to the appropriate line in the relevant parts list.

[Contents](#) Clicking here will take you to the Contents Page.

-  Clicking here will take you to the first page.
-  Clicking here will take you to the previous page.
-  Clicking here will take you to the next page.
-  Click here to go back to the previous view.

Alternatively, you may use the Acrobat Reader navigation buttons.

## Safety - Read This First!

### Warning symbols in this maintenance manual



Where there is a risk of personal injury, injury to others, or damage to the head or associated equipment, comments appear, highlighted by the word **WARNING!** and supported by the warning triangle symbol.

### Critical data

#### Mass

Mass (with one pan bar) **19 kg (42 lb)**

#### Load

Maximum Load **114 kg (250 lb)**

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## Abbreviations

The following abbreviations are used in this publication:

ac	alternating current	lb	pound (weight)
A	Amps	LF	Lubricated Friction
AF	across flats	LH	left hand
A/R	as required	MISO	metric thread
ASME	American Society of Mech Engineers	m	metre
assy	assembly	mm	millimetre
BS	British Standard	N	Newton
BA	British Association thread	NPT	National Pipe thread
BSF	British Standard Fine thread	NI	not illustrated
BSP	British Standard Parallel Pipe thread	No.	number
BSW	British Standard Whitworth thread	OD	outside diameter
btn	button	PCB	printed circuit board
chs	cheese	PCD	pitch circle diameter
C of G	centre of gravity	pozi	Pozidriv
comp	compression	psi	pounds per square inch
csk	countersunk	pt	point
cu	cubic	PTFE	Polytetrafluoroethylene
c/w	complete with	PVC	Polyvinyl chloride
dc	direct current	RH	right hand
dia	diameter	sect	section
ft	foot	skt	socket
hd	head	SWG	standard wire gauge
hex	hexagon	thk	thick
Hz	Hertz (frequency)	UNC	Unified Coarse thread
IC	integrated circuit	UNF	Unified Fine thread
ID	inside diameter	V	Volts
in.	inch	W	Watts
kg	kilogram		



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## Technical Specification

Height (Platform horizontal and standard cams) . . . . . 251 mm (9.875 in.)  
Width . . . . . 310 mm (12.2 in.)  
Minimum length . . . . . 381 mm (15 in.)  
Weight (One pan bar) . . . . . 19 kg (42 lb)  
Load capacity . . . . . 114 kg (250 lb)  
Slide plate range (Total) . . . . . 375 mm (14.75 in.)  
Lead screw adjustment . . . . . 279 mm (11 in.)

## Design Improvements

<b>Details</b>	<b>Serial No. Information</b>

## Section 1

# Introduction and Description

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## Introduction

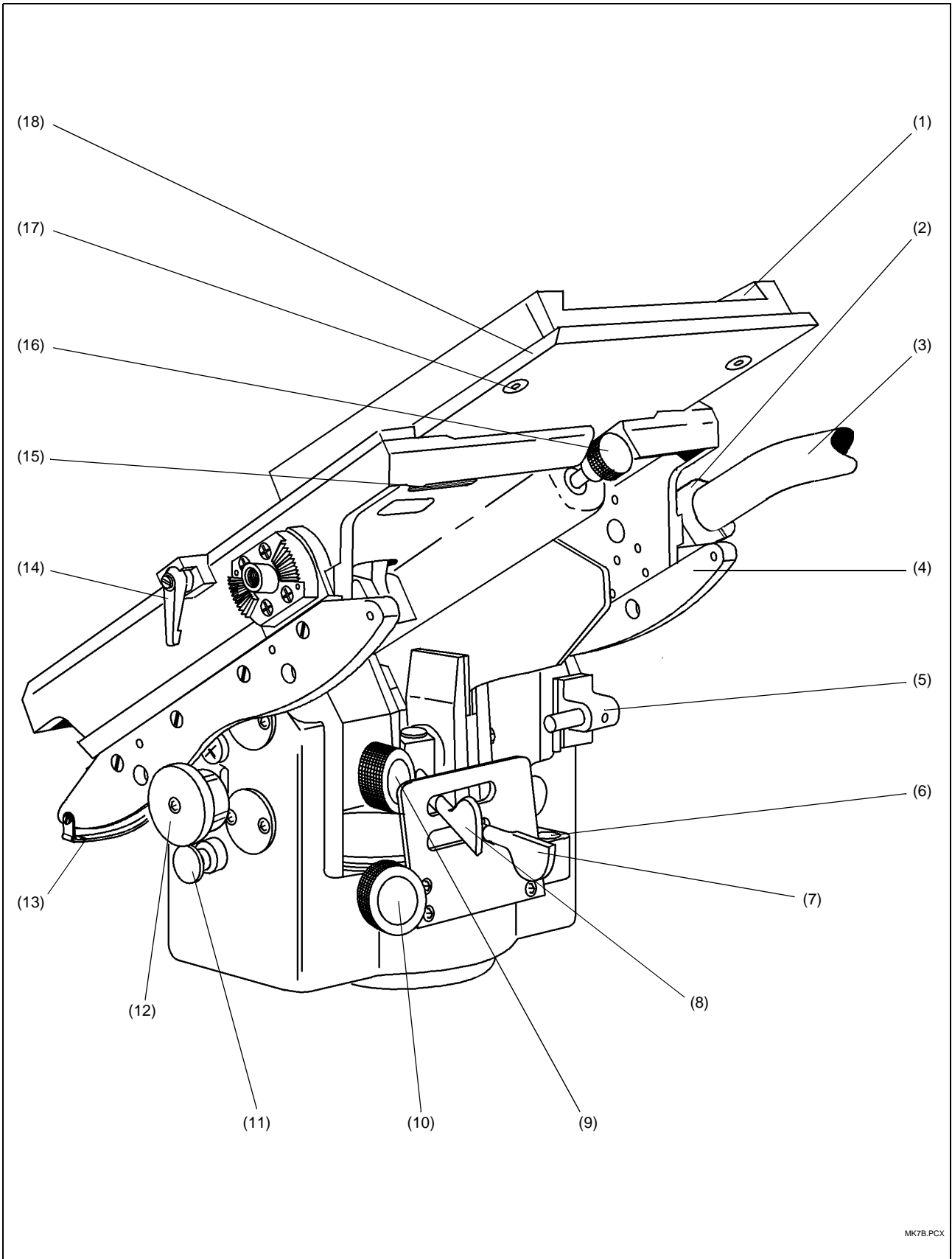
- 1 The Vinten Mk 7B LF Cam Head is a pan and tilt camera head, designed to support a variety of cameras, lenses and prompters in perfect balance over a tilt range of  $\pm 44.5^\circ$  to  $\pm 60^\circ$ , dependent on the cams fitted.
- 2 The head uses lubricated friction (LF) mechanisms in the pan and tilt axes giving adjustable drag to achieve smooth operation. Whip movements may be executed through both axes regardless of drag setting. Both pan and tilt mechanisms are fitted with a brake.
- 3 The head is fitted with a sliding plate giving a large range of fore and aft adjustment. This adjustment can be extended by moving a wedge adaptor to either of two positions on the sliding plate.
- 4 Construction is largely of aluminium alloy providing a lightweight but robust assembly able to accommodate loads of up to 114kg (250lbs). The head has a standard flat base and can be mounted on tripods, pedestals or any suitable firm surface.

## Description

- 5 The head consists of two main assemblies:
  - 5.1 The camera platform assembly
  - 5.2 The body assembly

### Camera platform assembly

6 The camera platform assembly comprises a casting in which a sliding plate (18) can be adjusted fore and aft by means of a lead screw. A wedge adaptor (1) is mounted on the sliding plate and accepts a standard camera mounting wedge. Two cam profile plates (4) are fitted, one on each side of the platform casting. These are a matched pair, selected from the range available, to enable the load placed on the head to be held in balance. The cam plates operate over two rollers (12) fixed to the body. The rollers support the total weight of the payload. A tilt brake cam plate is attached to the underside of the platform and slides between the brake shoes of the tilt brake assembly. When the tilt brake (8) is applied, the brake shoes clamp the plate and prevent movement in the tilt axis.



MK7B.PCX

Fig 1.1 Mk 7B LF Cam Head

7 The sliding plate (18) is adjustable 76 mm (3 in.) forward and 203 mm (8 in.) back providing a total range of 279 mm (11 in.). A further adjustment of 95 mm (3.75 in.) can be obtained by moving the wedge adaptor (1) to the alternative position to give adjustment of 171 mm (6.75 in.) forward and 108 mm (4.25 in.) back. A clamp (14) is provided to lock the sliding plate in position.

8 A locking device on the operating lever of the wedge adaptor prevents accidental release of the camera.

9 A tilt drag unit is mounted under the platform and provides drag in the tilt axis. The degree of drag is varied by means of an adjuster knob (9). The platform may be locked in any position by the tilt brake (8), or in the horizontal position by two cam bolts (5) which engage with the cam plates (4).

10 A telescopic pan bar (3) is provided with the head as standard. A second telescopic pan bar or non-telescopic pan bar suitable for mounting lens controls are available as an optional extra. Pan bar mounts are provided on each side of the platform, enabling the pan bars to be positioned radially through 360° in 6° increments.

## Body assembly

11 The body assembly comprises a casting which houses the pan drag mechanism and pan brake in its base. Each of the two body casting sidewalls houses two pairs of guide rollers, between which a platform guide bar is supported. A brake guard gate is mounted on the aft end of the pan housing and indicates the position of the pan and tilt brake levers. Tilt brake shoes are attached to one of the sidewalls and grip the tilt brake cam plate when applied. Two cam bolts (5) are mounted on the sidewalls and can be engaged with holes in each cam plate to secure the platform in the horizontal position. Two guide bar pins (11) in the sides of the body casting engage in holes in each guide bar and are used in conjunction with the cam bolts to support the platform for transport of the head or when changing the cams.

12 The guide rollers are mounted on pivots: four fixed, in the aft end of the sidewalls; and four eccentric, which can be adjusted, in the fore end of each sidewall. The fixed rollers run in grooves in the guide bars to prevent lateral movement.

13 Cam rollers (12) are attached to both sidewalls and support the weight of platform and camera.

14 The degree of pan drag is varied by an adjusting knob (10) located adjacent to the brake guard gate. Movement in the pan axis is braked by a clamp acting on a disc in the pan housing.

15 A circular spirit level (6), mounted in a lug on the rear face of the body, is used to level the head before use.

16 The bottom of the body forms a standard flat base with four 3/8in. BSW mounting bolt holes equispaced on a 4 3/8in. diameter.

## Section 2

# Operation

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## General

1 To identify components, please refer to [Fig 1.1](#).

## Installation

### Unpacking

2 The Vinten Mk 7B LF Cam Head is supplied with one telescopic pan bar, an Operators Guide, four mounting bolts and a spanner. A second pan bar and a carrying case are optional. Ensure that all items are unpacked prior to disposal of the packing materials.

3 After unpacking, remove the head from its carrying case (if supplied) and ensure that:

3.1 The cam bolts (5) and the guide bar pins (11) are engaged ([Para 10](#)). Always engage both the cam bolts and the guide bar pins before lifting or carrying the head.

3.2 The pan and tilt brakes (6)(7) are on ([Para 17](#)).

3.3 The surfaces of the cam plates (4) and cam rollers (5) are clean and free of packing material.

### Mounting the head

- 4 The head is mounted on a tripod, pedestal or suitable firm surface using the four fixing bolts. Tighten the bolts with the spanner provided, and store the spanner on the underside of the platform by pressing it against the Velcro pad (15). After mounting the head, use the level bubble (6) to set it level.
- 5 Fit the pan bar(s) (3) to the head and adjust the position of each one before tightening the clamp (2).

## Fitting a camera



**WARNING!: Do not rely on the tilt brake when changing the payload. Always engage the platform cam bolts**

- 6 The camera fitting and balancing procedure assumes that cam plates suitable for the load C of G height are fitted to the head. The LF number, cast into the inner side of each cam plate, corresponds to the load C of G height in inches. The range of cam plate profiles is detailed in Table 6.1. See Section 4 for instructions on changing the cam plates.
- 7 To fit a camera, proceed as follows:
  - 7.1 Attach the wedge to the camera.
  - 7.2 Lower the pedestal to a convenient working height.
  - 7.3 Ensure that the cam bolts (5) are engaged (Para 11).
  - 7.4 Slide the wedge adaptor operating lever forward (parallel to the wedge) about 6 mm (1/4 in.) against spring tension. Pull the operating lever out, away from the body of the wedge adaptor, as far as it will go.
  - 7.5 Insert the camera wedge into the wedge adaptor (1) and push it forward into full engagement. Push in the operating lever until it lies parallel with the wedge adaptor body. During this operation resistance of the spring-loaded over-centre mechanism will be felt. As the lever reaches the end of its travel it will slide back (parallel to the wedge) to the locked position.
  - 7.6 Confirm that the lever is in the locked position. This is indicated by coloured bands above the lever. When the green band only is visible, the lever is locked. If any of the red band can be seen the lever is not locked.

## Balancing the head

**NOTE: It is important that all camera accessories (lens, zoom and focus controls, prompter etc.) are fitted before balancing the head. Any equipment fitted later will unbalance the head.**

- 8 Balance the head as follows:
  - 8.1 Fit the camera and accessories to the head.
  - 8.2 Turn the tilt drag adjustment knob (9) to its minimum setting.
  - 8.3 Disengage the platform locking mechanism (Para 10) but hold the pan bar to steady the platform.

8.4 Release the sliding plate clamp (14) and move the sliding plate fore and aft by means of the balance knobs (16) to achieve horizontal balance. The horizontal balance is correct when no perceptible tilting force can be felt on the pan bar with the platform level. Apply the sliding plate clamp (14).

8.5 If there is insufficient movement in the sliding plate to achieve balance, reposition the wedge adaptor (see page 23), refit the load and repeat the balancing procedure.

8.6 When horizontal balance has been achieved, use the pan bar to tilt the platform forward and backward to confirm that the cam profile fitted to the head matches the C of G height of the load. When correctly balanced, there should be no perceptible tilting force on the pan bar at any angle of tilt and the head should remain in any tilt position to which it is set.

8.7 If the head tends to fall away from the horizontal when balanced, cam plates with a higher LF number should be fitted. If the head tends to spring back, fit cam plates with a lower LF number (see page 25).

9 After balancing, release the pan brake (7) and exercise the head through both axes to confirm that it operates smoothly.

## Operation

### Locking the platform

10 The platform locking mechanism consists of two cam bolts (5), one at the front and one at the rear of the head, which engage with holes in the cams; and two guide bar pins (11), one on each side of the body casting, which engage with holes in the guide bars.

11 The cam bolts are used to secure the platform in a level position while fitting or removing the payload.

12 When the guide bar pins are engaged, the cam plates are raised clear of the cam rollers. This is a safety feature intended for use when the head is transported.

13 The cam bolts and guide bar pins must be disengaged during normal use.

14 To disengage the platform locking mechanism:

14.1 Lower the pedestal to a convenient working height.

14.2 Release the tilt brake (8).

14.3 Pull up on the pan bar to relieve the weight of the platform on the rear cam bolt.

14.4 Pull the rear cam bolt (5) back to the stop and move its handle downwards through 90°.

14.5 Press down on the pan bar to relieve the weight of the platform on the front cam bolt.

14.6 Pull the front cam bolt (5) back to the stop and move its handle downwards through 90°.



**WARNING!:** Do not allow the cams to come into sudden contact with the rollers as this will damage the cam profile and lead to jerky operation in the tilt axis.



14.7 Gently lower the pan bar to bring the rear profiles of the cams into contact with the cam rollers. Applying a slight downwards pressure on the pan bar, pull out the two guide bar pins (11) to their fullest extent.

15 To engage the guide bar pins:

15.1 Lower the pedestal to a convenient working height.

15.2 Release the tilt brake (8).

15.3 Starting with the platform level, push in either of the guide bar pins (11) and move the pan bar downwards until the pin engages with the hole in the guide bar. Push the pin fully home, ensuring that the head of the pin abuts its housing. Push the guide bar pin on the opposite side of the head fully home.

16 To engage the cam bolts:

16.1 Lower the pedestal to a convenient working height.

16.2 Release the tilt brake (8).

16.3 Raise the pan bar to bring the platform level and align the hole in the cam with the front cam bolt (5).

16.4 Rotate the handle of the bolt upwards through 90° and push the bolt fully home in the cam plate. When fully home the end of the cam bolt reaches through the hole in the cam plate to within 2 mm (1/16 in.) of the outer face.

16.5 Tilt the platform as necessary to align the hole in the cam with the rear cam bolt (5).

16.6 Rotate the handle of the rear cam bolt upwards through 90° and push the bolt fully home in the cam plate.

## Pan and tilt brakes

17 The pan and tilt brakes are operated by levers (7)(8) at the rear of the head. They are applied by moving the appropriate lever to the left and released by moving the lever to the right. The tilt brake (8) should be applied whenever the camera is to be left unattended.

## Pan and tilt drag

18 Tilt drag is adjusted by a knob (9) mounted on the rear face of the tilt drag housing. The pan drag adjustment knob (10) is mounted to the left of the brake guard. Turn the knobs clockwise to increase drag and counter-clockwise to decrease drag.

---

**NOTE:** Turn both pan and tilt drag settings to minimum whenever the head is to be left out of use for more than a few hours or is to be stored.

---



**WARNING!:** Use only hand force when adjusting the drag setting. do not over-tighten.

---

## Section 3

# Tools and Materials

### Special tools

1 The following special tools are required for certain procedures detailed in Sections 4 and 5

Item	Part No.	Use
Setting plate	T23236	Tilt lock
Spanner	3388-21	Mounting bolts

### Consumable materials

2 The following consumable materials are required for certain procedures detailed in Sections 4 and 5.

Item	Part No.	Use
Grease, white bearing	Z150-085	Bearings and adjustment screws in main assy, tilt drag assy and wedge adaptor assy
Grease, Chesterton	Z150-105	Guide bar pin `O' rings
Primer, Loctite Activator `T'	Z002-019	Primer for use with Loctite adhesives 222E, 270, 601 and 638
Adhesive, Loctite 601	Z002-020	Main assembly and cam follower
Adhesive, Loctite 270	Z002-034	Screw locking in main assembly, tilt drag assembly and wedge adaptor assy
Adhesive, Silcoset silicone rubber	Z002-036	Level bubble installation
Adhesive, Loctite 638	Z002-058	Permanent assembly of components in main assembly, pan bar assembly, quadrant assembly and tilt drag assembly
Adhesive, Permabond E31 (2 part) (MA)	Z002-070	Permanent assembly of components in main assembly
Adhesive, Permabond ESP110 (MA)	Z002-073	Permanent assembly of components in main assembly and pan bar assembly
Adhesive, Loctite 641	Z002-074	Permanent assembly of components in tilt drag assembly
Adhesive, Loctite 222E	Z002-075	Fastener locking in main assembly and tilt drag assembly
Adhesive, Loctite 380 "Jet black"	Z002-078	Drag adjustment guide bushes in pan drag assembly and tilt drag assembly
Drag fluid, Vinten Fluid No. 3	3051-30	Pan and tilt drag mechanisms

## Section 4

# Servicing

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## General

1     The Mk 7B LF Cam Head is robustly made to high engineering standards using sealed units. Therefore very little attention or servicing is required other than regular cleaning. Should servicing or repair involving dismantling become necessary, refer to [Section 5](#) of this manual.

## Cleaning

2     During normal use the only cleaning required should be a regular wipe over with a lint-free cloth. Dirt accumulated during storage or periods of disuse may be removed with a semi-stiff brush. Particular attention should be paid to the surfaces of the cam plates and cam rollers, the mounting face of the head and the wedge location faces of the wedge adaptor.

3     Use out of doors under adverse conditions will require special attention. Salt spray should be washed off using fresh water at the earliest opportunity. Sand and dirt act as an abrasive and should be removed using a semi-stiff brush or a vacuum cleaner.

**NOTE: Use only detergent-based cleaners. DO NOT use solvent- or oil-based cleaners, abrasives or wire brushes to remove accumulations of dirt as these damage the protective surfaces. DO NOT use oil or grease on the cam profiles, guide bars or wedge adaptor faces. This is unnecessary and traps dirt which acts as an abrasive.**

## Routine checks

- 4 During normal use check the following:
  - 4.1 The effectiveness of the sliding plate clamp.
  - 4.2 The effectiveness of the pan and tilt brakes.
  - 4.3 Fore and aft play in the platform guide bars.

## Adjustments

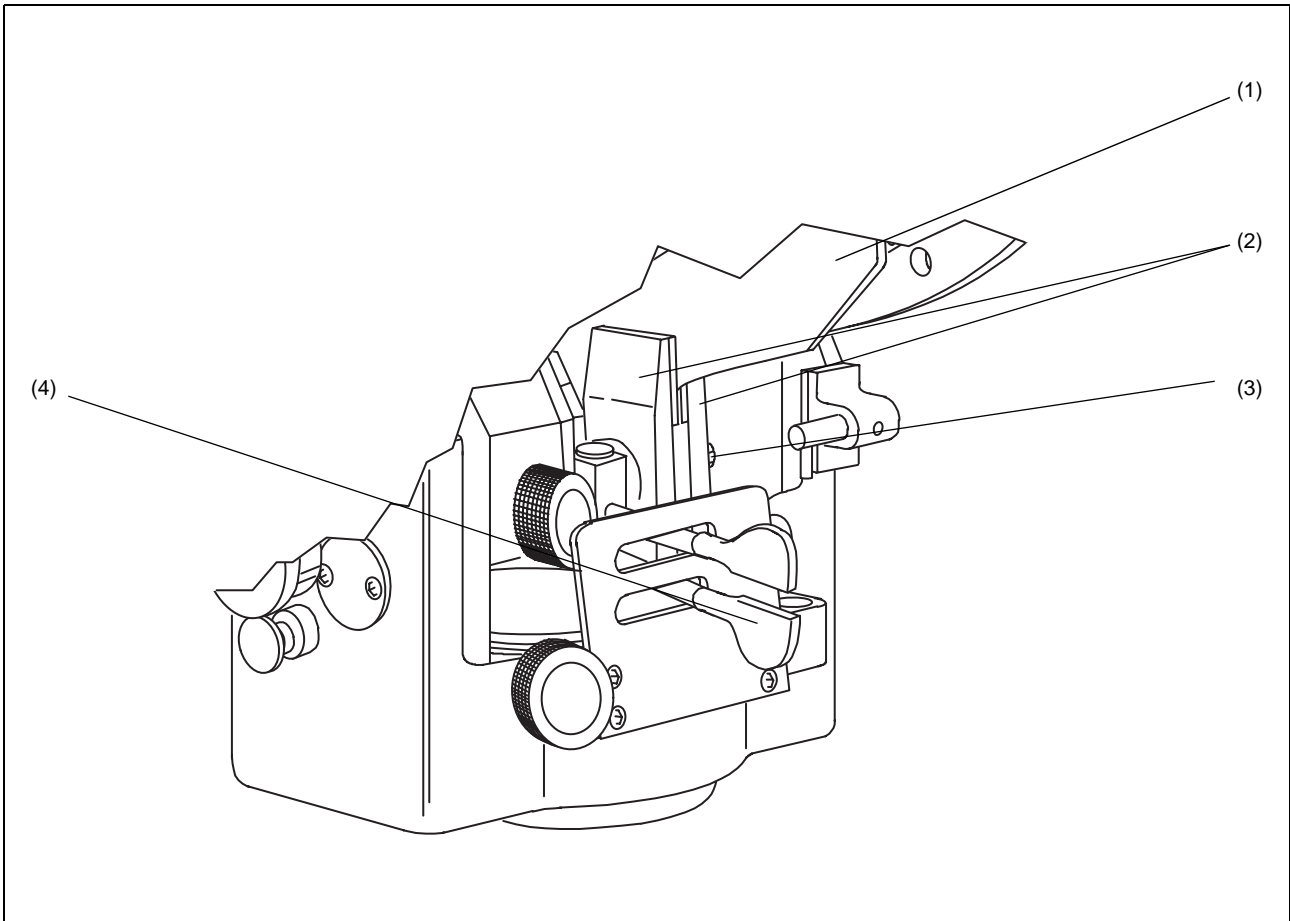
- 5 The following adjustments may become necessary after considerable use:
  - 5.1 Taking up wear in the sliding plate clamp.
  - 5.2 Taking up wear in the pan and tilt brakes.
  - 5.3 Elimination of fore and aft play in the guide bars.

### Taking up wear in the sliding plate clamp

- 6 To adjust the sliding clamp:
  - 6.1 The clamp lever has a spline adjustment which is held in engagement by a spring. Pull the lever outwards against its spring, rotate counter-clockwise to the stop and release.
  - 6.2 Repeat this procedure until the clamp locks the sliding plate when applied but allows free movement when released. Check the action of the clamp at several positions along the length of slide travel.

### Taking up wear in the tilt brake

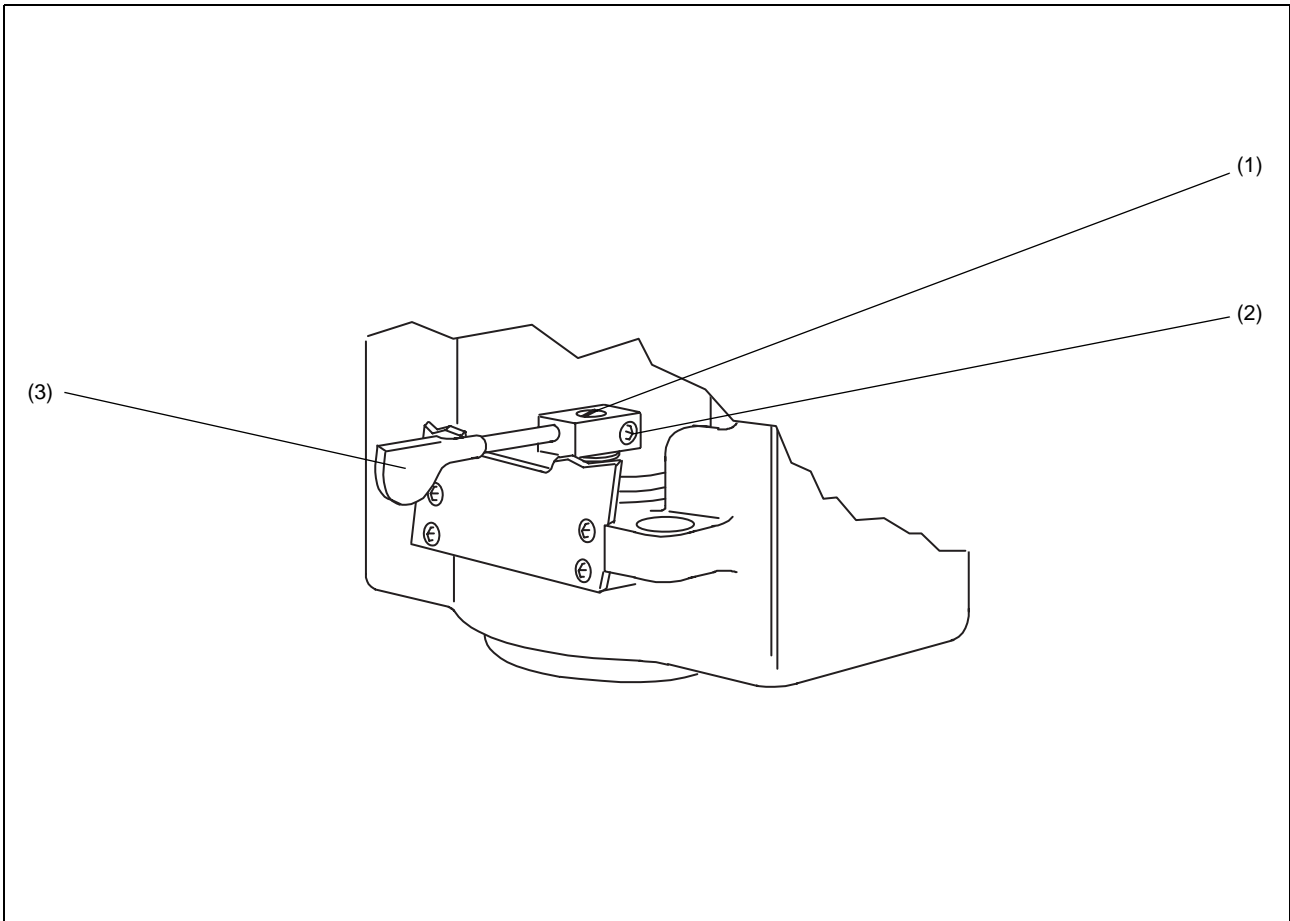
- 7 Should the tilt brake become ineffective, adjust as follows ([Fig 4.1](#)):
  - 7.1 Ensure that the cam bolts and guide bar pins are disengaged and tilt drag is set to minimum.
  - 7.2 Adjust nut (3) clockwise until the tilt brake is effective and clearance between tilt brake cam plate (1) and tilt brake shoes (2) is achieved when the brake is released.
  - 7.3 Whilst carrying out this procedure:
    - 7.3.1 Gently rock the platform to ensure that there is no braking effect with the brake released.
    - 7.3.2 Move tilt brake lever (4) left and right to the extremes of its travel and ensure that a moderate resistance is felt at the mid-point of travel, indicating that the tilt brake fork cam has passed over the top-dead-centre position.
  - 7.4 Check tilt brake operation and re-adjust if necessary.



**Fig 4.1 Taking up wear in the tilt brake**

## Taking up wear in the pan brake

- 8 Should the pan brake become ineffective, adjust as follows (Fig 4.2):
  - 8.1 Ensure that pan drag is set to minimum.
  - 8.2 Move pan brake lever (3) fully to the left.
  - 8.3 Using a 4mm hexagon wrench, slacken brake lever clamping screw (2).
  - 8.4 Using a flat-bladed screwdriver in a torque wrench, turn brake shaft (1) clockwise to a torque setting of 5.1 Nm (45 lbf in.).
  - 8.5 Tighten brake lever clamping screw (2) while holding pan brake lever (3) fully to the left.
  - 8.6 Check operation of the brake. The brake should be fully on when brake lever (3) is to the left of the brake guard, and off when the lever is to the right. Re-adjust if necessary.



**Fig 4.2 Taking up wear in the pan brake**

**Elimination of fore and aft play in the guide bars.**

9 Fore and aft play in the guide bars is eliminated by adjustment of the eccentric shafts which carry the guide rollers.



**WARNING!:** The payload must be removed from the head before starting this adjustment. Lifting and lowering the of the platform must be carried out by two persons.

10 To adjust the guide rollers:

10.1 Remove the payload and disengage the locking mechanism.

10.2 Remove the pan bar(s).

10.3 Check that the tilt brake is released. With the aid of an assistant, lift the platform to its full extent, keeping it level. Chock the platform securely in the raised position.



**WARNING!: Chock the platform securely in the raised position before proceeding.**

10.4 Referring to [Fig 6.2 \(Section 6\)](#), slacken three screws (38) which secure each clamp plate (61). There are two clamp plates on each side of the head, forward of the cam plate roller.

10.5 Using a flat-bladed screwdriver, turn each guide roller eccentric shaft (62) until fore and aft play is eliminated in the guide bars. The upper left and lower right guide roller shafts should be turned clockwise, the upper right and lower left guide roller shafts should be turned counter-clockwise.

10.6 Tighten three screws (38) to secure each clamp plate (61).



**WARNING!: Do not allow the platform assembly to drop sharply onto the cam followers.**

10.7 With the aid of an assistant, remove the chocks and lower the platform, guiding tilt lock cam plate into position in tilt brake assembly. Do not allow platform assembly to drop sharply onto cam followers.

10.8 Check that tilt movement is free and that fore and aft play has been eliminated.

10.9 Refit the pan bar(s) and engage the cam bolts.

10.10 Refit the payload.

## Repositioning the wedge adaptor

11 The wedge adaptor is secured by four countersunk head screws which pass through the sliding plate into the wedge adaptor. Access to these screws is obtained by moving the sliding plate almost to the end of its travel. In this position the heads of the outer pair of screws are exposed and the inner pair may be reached through holes in the platform casting.

12 To reposition the wedge adaptor:

12.1 Engage the cam bolts and remove the payload.

12.2 Disengage the cam bolts and release the tilt brake.

12.3 Tilt the platform so that the wedge adaptor is at its highest position and apply the tilt brake.

12.4 Release the sliding plate clamp and turn the balance knob to move the sliding plate until the heads of the lower pair of screws which secure the wedge adaptor to the sliding plate are accessible through the holes in the platform casting.

12.5 Hold the body of the wedge adaptor and use a 5mm hexagon wrench to remove four securing screws. Remove the wedge adaptor from the sliding plate.

12.6 Release the tilt brake and tilt the platform as far as it will go in the opposite direction. Apply the tilt brake.

12.7 Hold the wedge adaptor on the sliding plate in the new position and identify the holes for the fixing screws.

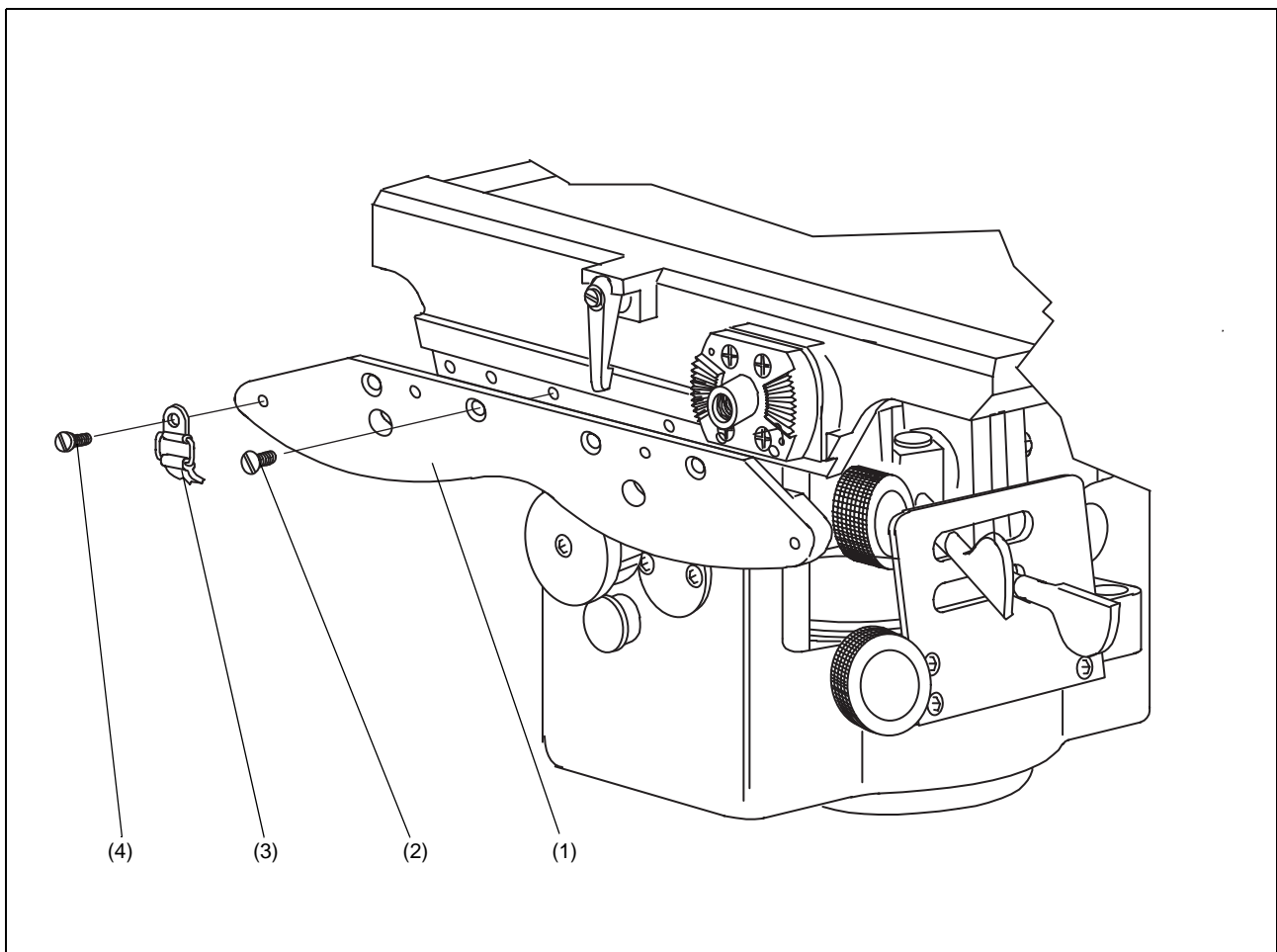
12.8 Turn the balance knob to move the sliding plate towards the opposite end of its travel until the holes for the lower pair of wedge adaptor securing screws are centred in the holes in the platform casting.

12.9 Ensuring that the narrow end of the wedge adaptor faces forwards, hold it in position on the sliding plate and insert two screws in the holes nearest to the end of the sliding plate. Do not tighten.

12.10 Insert the two remaining screws and tighten all four screws.

12.11 Turn the balance knob to move the sliding plate inwards until the end of the sliding plate is approximately level with the end of the platform casting. Apply the sliding plate clamp.

12.12 Release the tilt brake, return the platform to level and engage the platform locking mechanism.



**Fig 4.3 Changing cam plates**



## Changing cam plates

13 The Mk 7B LF Cam Head is supplied in 13 versions, each fitted with different profile cam plates which enable payloads with C of G heights from 101.6 mm (4 in.) to 254 mm (10 in.) to be balanced over the full tilt range. Provided the cams are not changed from 127.0 mm (5.0 in.) or above to 114.3 mm (4.5 in.) or below, or vice versa, the procedure may be carried out with the payload installed ([Fig 4.3](#)).



**WARNING!: If the payload is installed on the head, remove only one cam plate at a time.**

14 If the cams are to be changed from 127.0mm (5.0in.) or above to 114.3mm (4.5in.) or below, or vice versa, the payload must be removed and the platform chocked mechanically, since the cam bolts and guide bar pins cannot be used.

15 Dependent on the size of cam being fitted or removed, change the cam plates as follows:

15.1 If the cams ARE NOT to be changed from 127.0 mm (5.0 in.) or above to 114.3 mm (4.5 in.) or below, or vice versa:

15.1.1 Lower the pedestal to a convenient working height.

15.1.2 Bring the platform level and engage both guide bar pins, then both cam bolts ([See "Locking the platform" on page 16](#)). Apply the tilt brake.

15.1.3 Remove the pan bar(s).

15.1.4 Remove two screws (4) securing the carrying handle (3) to the cam plates (1).

15.1.5 Release the cam bolt from one of the cam plates. Remove four screws (2) securing that cam plate (1) to the platform. Pull the cam plate off the dowel pins.

15.1.6 Ensure that both replacement cam plates have the same LF number. Locate a cam plate on the dowel pins and secure with four screws (2).

15.1.7 Engage the cam bolt in the cam plate.

15.1.8 Repeat the above procedure for the other cam plate.

15.1.9 Secure the carrying handle (3) to the front end of the cam plates with two screws (4).

15.1.10 Refit the pan bar(s).

15.1.11 Hold the pan bar, disengage both cam bolts and release the tilt brake.



**WARNING!: Do not allow the cams to come into sudden contact with the rollers as this will damage the cam profile and lead to jerky operation in the tilt axis.**

15.1.12 Gently lower the pan bar to bring the cams into contact with the cam rollers. Apply downwards pressure to the pan bar to relieve the weight of the platform on the guide bar pins.

15.1.13 Withdraw both guide bar pins and bring the platform level. Check that tilt movement is free and smooth.

15.2 If the cams ARE to be changed from 127.0 mm (5.0 in.) or above to 114.3 mm (4.5 in.) or below, or vice versa:

- 15.2.1 Bring the platform level, engage both cam bolts and remove the payload.
- 15.2.2 Disengage the cam bolts and lift the platform until the cams are well clear of the rollers.
- 15.2.3 Insert a 25mm (1.0in.) chock under the tilt drag housing.
- 15.2.4 Remove the pan bar(s).
- 15.2.5 Remove two screws (4) securing the carrying handle (3) to the cam plates (1).
- 15.2.6 Remove four screws (2) securing each cam plate (1) to the platform. Pull the cam plates off the dowel pins.
- 15.2.7 Ensure that both replacement cam plates have the same LF number. Locate each cam plate on its dowel pins and secure with four screws (2).
- 15.2.8 Secure the carrying handle (3) to the front end of the cam plates with two screws (4).
- 15.2.9 Refit the pan bar(s).
- 15.2.10 Remove the chock and carefully lower the platform.



**WARNING!: Do not allow the cams to come into sudden contact with the rollers as this will damage the cam profile and lead to jerky operation in the tilt axis.**

- 15.2.11 Check that tilt movement is free and smooth.
- 15.2.12 Bring the platform level, engage the cam bolts and apply the tilt brake.
- 15.2.13 Refit the payload.

## Section 5

# Repair

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## General

1     Repair and renewal of damaged items involves disassembling various components and must be carried out in accordance with the following instructions. Any load must be removed from the head before carrying out the following procedures.

2     Disassembly and assembly is carried out in conjunction with figures in the [Illustrated Parts List \(Section 6\)](#). During disassembly it is advisable to examine all screws, washers and nuts, etc for damage and to replace

circlips and 'O' rings as a matter of course. The Omniseal in the pan mechanism need not be replaced unless damaged or leaking.

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**NOTE:** The head is described from the operator's viewpoint i.e. front is away from the operator (lens end) and rear is towards the operator (control end).

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## Disassembly

### Platform



**WARNING!** The payload must be removed from the head before removing the platform. Lifting and lowering of the platform must be carried out by two persons.

---

- 3 To remove the platform:
    - 3.1 Remove the payload and disengage the locking mechanism.
    - 3.2 Remove the pan bar(s).
    - 3.3 Check that the tilt brake is released. With the aid of an assistant, lift the platform to its full extent, keeping it level. Chock the platform securely in the raised position.
- 



**WARNING!** Chock the platform securely in the raised position before proceeding.

---

- 3.4 Referring to [Fig 6.2](#) remove two guide bar stops (30) and washers (12).
    - 3.5 With the aid of an assistant, lift the platform vertically until clear of the head.
  - 4 To dismantle the platform ([Fig 6.1](#)):
    - 4.1 Note the position of wedge adaptor (1) on sliding plate (39). Remove the wedge adaptor ([See "Repositioning the wedge adaptor" on page 23](#)).
    - 4.2 Remove two screws (10) which secure plate (42) and clamp block (40) to platform (38).
    - 4.3 Unscrew sliding plate clamp lever (41) from the platform by pulling the lever outwards against its spring, turning it clockwise and releasing.
    - 4.4 Remove screw (9) from the sliding plate.
    - 4.5 Withdraw sliding plate (39) from the dovetailed recess in the platform, noting its orientation for assembly.
    - 4.6 Remove four screws (21) which secure each pan bar bracket (19) to platform (38).
-

- 4.7 Withdraw the pan brackets from the platform complete with two Spirol pins (22). Drift out the Spirol pins.
- 4.8 Remove two screws (15) which secure carrying handle (14) to cam plates (16).
- 4.9 Remove four screws (18) which secure each cam plate (16) to platform (38).
- 4.10 Remove both cam plates from the platform by pulling them in line with the locating dowel pins (17). Dowel pins (17) are secured in the platform with Loctite, do not remove unless damaged or loose.
- 4.11 At front and rear ends of the platform remove a Spirol pin (2) from knob (4) and slide each knob off adjusting screw (7).
- 4.12 Drift adjusting screw (7) towards the rear of the platform until bush (34) is free of the platform casting. Remove the bush.
- 4.13 Slide the adjusting screw towards the rear of the platform until the front end is clear of the trough bearing, lift it out of the trough and slide it forward out of the platform.
- 4.14 Unscrew adjuster bush (11) from the adjusting screw.
- 4.15 Referring to [Fig 6.2](#) remove four nuts (8), washers (7) and screws (6) which secure tilt brake cam plate (9) to platform ([Fig 6.1](#) item 38).
- 4.16 Referring to [Fig 6.1](#) remove two screws (10) which secure hinge ([Fig 6.2](#) item 68) to platform (38).
- 4.17 Referring to [Fig 6.2](#) remove two screws (8) which secure link bracket (23) to platform (38).
- 4.18 Slacken link bar clamp screw (30) and slide link bar (31) off the shaft of the tilt drag unit and remove link bar (31), link arm (28) and link bracket (23) as an assembly.
- 4.19 Referring to [Fig 6.2](#) remove four screws (62) which secure tilt drag assembly to LH guide bar (64).
- 4.20 Referring to [Fig 6.1](#), slacken a grub screw (12) on each side of the platform and drift out both guide bar pins (13).
- 4.21 Referring to [Fig 6.2](#), remove guide bars (26) and (64) from the platform, noting the number and position of shims (63) on each side of LH guide bar (64).
- 4.22 If required, remove bearings (65) and buffers (61) from the guide bars.
- 4.23 Slacken grub screw (91) and drift out bracket pin (67) from tilt drag unit to release hinge (68).

## Tilt drag unit

- 5 To remove the tilt drag unit ([Fig 6.2](#)):
  - 5.1 Remove the wedge adaptor ([See "Repositioning the wedge adaptor" on page 23](#)).
  - 5.2 Remove the platform ([Para 3](#)).
  - 5.3 Referring to [Fig 6.1](#) release the sliding plate clamp lever (41).
  - 5.4 Remove screw (9) from the sliding plate.

- 5.5 Withdraw sliding plate (39) from dovetailed recess in platform and collect clamp block (40). Note the orientation of the sliding plate for assembly.
  - 5.6 Remove two screws (8) which secure link bracket (23) to platform (38).
  - 5.7 Slacken link bar clamp screw (30), slide link bar (31) off the squared part of the drag unit shaft and remove link bar (31), link arm (28) and link bracket (23) as an assembly.
  - 5.8 Remove two screws (10) which secure hinge (Fig 6.2 item 68) to platform (38).
  - 5.9 Referring to Fig 6.2, remove four screws (62) and lift tilt drag unit from platform.
- 6 To dismantle the tilt drag unit (Fig 6.2):

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**NOTE: The tilt drag unit is filled with Vinten fluid No. 3 which must be drained out into a suitable receptacle after removing cover (19). Barrier cream should be used when working with lubricants.**

---

- 6.1 Turn tilt drag knob (87) counter-clockwise until it is unloaded.
- 6.2 Remove bleed screw (76) from cover (75). Remove seven screws (79) which secure cover (75) to housing (66). Draw the cover, complete with bearing (77) and Spirol ring (78), off the shaft of tilt drag drum (90). Carefully remove gasket (74). Remove two washers (71) from tilt shoe pivot pins (73). Allow the Vinten fluid No. 3 to drain into a suitable receptacle. Discard the fluid.
- 6.3 Turn tilt drag knob (87) to gain access to circlip (83) and remove the circlip from tilt drag actuator (86). Discard the circlip.
- 6.4 Turn tilt drag knob (87) counter-clockwise until tilt drag actuator (86) disengages from tilt drag actuator shaft (72) and withdraw the tilt drag actuator complete with knob (87) and two 'O' rings (85), leaving housing bush (84) in position. Remove and discard 'O' rings (85) taking care to avoid damage to the grooves in tilt actuator (86).
- 6.5 Withdraw tilt drag drum (90) from housing (66).
- 6.6 Remove two 'O' rings (80) from shaft of tilt drag drum (90) taking care to avoid damage to grooves in shaft.
- 6.7 Lift tilt drag shoes (69) and (91), actuator shaft (72) and thrust washer (82) from shoe pivot pins (73) in the housing. Note positions of washers (71) - two on each pivot pin between the housing and the drag shoe and one on each pivot pin between the drag shoe and the cover. Remove tilt shoe pivot pins (73).
- 6.8 Press bearing (77) out of housing (66).
- 6.9 Remove Spirol ring (78) from cover (75) and press out bearing (77).
- 6.10 If required, press housing bush (84) into housing recess to break adhesive joint and remove.

## Tilt brake assembly

- 7 To remove and dismantle the tilt brake assembly (Fig 6.2):
  - 7.1 Remove the platform from the head (Para 3).

- 7.2 Remove split pin (1) and discard. Withdraw tilt brake pin (2) and move tilt brake fork (52) clear of eyebolt (3).
- 7.3 Unscrew and remove two pivot screws (29).
- 7.4 Lift out the tilt brake assembly complete with shim washers (10).
- 7.5 Note position and number of shim washers (10). If required, break the Loctite seal of pivot shaft (11) in the fixed brake shoe by tapping sharply with a soft-faced hammer. Withdraw pivot shaft (11).
- 7.6 Remove nut (13) and washer (12) and withdraw eyebolt (3) and washer (4) from brake assemblies (5) and (14).
- 7.7 Remove four screws (17), two spring plates (16) and spring (15) from the brake shoes. Note that screws (17) are retained with Loctite.

## Cam bolts

- 8 To remove the cam bolts ([Fig 6.2](#)):
  - 8.1 Ensure that both cam bolts are set in the disengaged position.

**NOTE:** Locating ball (19) and spring (18) are held in position by the cam bolt bracket. Ensure they are not lost during dismantling.

- 8.2 Remove two screws (21) which secure each cam bolt bracket (20) to body (43). Retain locating ball (19) and spring (18).
- 8.3 Slacken grub screw (22) and remove the cam bolt (23) from the bracket.

## Fixed guide bar rollers

- 9 There are four fixed guide bar rollers at the rear end of the head. To remove the rollers ([Fig 6.2](#)):
  - 9.1 Remove the platform from the head ([Para 3](#)).
  - 9.2 Remove two screws (27) which secure each roller cover (49) and (53) to the head.
  - 9.3 Remove screw (59) and washer (58) from each guide roller shaft (56) and slide off bearing (57).
  - 9.4 If required, remove two screws (32) which secure each guide roller shaft (54) to the head and withdraw the guide roller shafts.

## Adjustable guide bar rollers

- 10 There are four adjustable guide bar rollers at the front end of the head. To remove the rollers ([Fig 6.2](#)):
  - 10.1 Remove the platform from the head ([Para 3](#)).
  - 10.2 Remove two screws (27) which secure each roller cover (28) and (60) to the head.
  - 10.3 Remove screw (59) and washer (58) from each guide roller eccentric shaft (56) and slide off bearing (57).

- 10.4 If required, remove three screws (32) which secure each clamp plate (55) to the head.
- 10.5 Withdraw guide roller eccentric shafts (56) from the head.

## Cam followers

- 11 To remove the cam followers (Fig 6.2):
  - 11.1 Remove the platform from the head (Para 3).
  - 11.2 Remove screw (35) and cam roller cover (34) and slide cam follower assembly (33) from cam roller shaft (31).
  - 11.3 Remove two screws (332) which secure cam roller shaft (31) to head.

## Guide bar pins

- 12 To remove and dismantle the guide bar pins (Fig 6.2):
  - 12.1 Unscrew parking bar sleeve (38) from side of body (43) to remove complete guide bar pin assembly from head.
  - 12.2 Push parking bar (36) into parking bar sleeve as far as possible.
  - 12.3 Using suitable packing, grip the head of parking bar (36) in a vice.
  - 12.4 Heat the exposed part of location plug (40) sufficiently to degrade the Loctite bond then unscrew location plug (40) complete with stop plate (39). Allow parts to cool.
  - 12.5 Withdraw parking bar (36) from parking bar sleeve (38). Extract 'O' ring (37) from groove near outer end of bore of parking bar sleeve (38) and discard.

## Pan mechanism

- 13 To remove the pan mechanism(Fig 6.3):
  - 13.1 Remove the platform from the head (Para 3).
  - 13.2 Remove the tilt brake assembly from the head (Para 7).
  - 13.3 Referring to Fig 6.2, slacken screw (51) and remove four screws (45) which secure brake gate (44) to the head.
  - 13.4 Slide pan brake boss (Fig 6.2 item 50) off brake shaft (41) and remove pan brake lever, tilt brake lever and brake gate together.
  - 13.5 Turn pan drag knob (32) counter-clockwise until it is unloaded.



13.6 Use a flat bladed screwdriver to turn the head of pan brake shaft (41) counter-clockwise to release the pan brake and then unscrew and remove the pan brake shaft. Remove and discard 'O' ring (40) taking care to avoid damage to the groove in pan brake shaft (41).

---

**NOTE:** The pan drag mechanism is filled with Vinten fluid No. 3 which must be drained out into a suitable receptacle after removing cover (2). Barrier cream should be used when working with lubricants.

---

13.7 Remove six screws (1) which secure cover (2) to pan drag housing (11). Remove cover (2), gasket (10) and four washers (9). Drain the Vinten fluid No. 3 into a suitable receptacle and discard. Take care to avoid damaging gasket (10).

13.8 Secure the head on a suitable support using four screws and washers (23) and (22).

13.9 Remove screw (3), which is secured with Loctite, and clamp washer (4).

13.10 Start two M5 screws, with threads at least 30mm long, in the tapped holes in the top face of pan friction drum (5). Turn the screws into the tapped holes until they contact the bottom of pan drag housing (11). Tighten the screws equally to draw pan drag drum (5) off pan bearing shaft (24).

13.11 Remove circlip (35) from pan drag actuator (30) and discard.

13.12 Turn pan drag knob (32) counter-clockwise until pan drag actuator (30) disengages from pan drag shaft (6) and withdraw the pan drag actuator complete with knob (32), locknut (33) and two 'O' rings (29). Remove and discard 'O' rings (29) taking care to avoid damage to the grooves in pan actuator (30).

13.13 Pull out two drag shoe pivot pins (7) and lift out drag shoes (37) and (8) complete with pan drag shaft (6) and thrust washer (36). Remove two washers (9) from the bottom of pan drag housing (11).



**WARNING!** Ensure that the main body casting (Fig 6.2 item 43) is not lifted relative to base ring (21) during removal of pan drag housing as this will distort pan brake disc (18).

---

13.14 Remove four screws (12) and draw pan drag housing (11), complete with Omniseal (13), seal retainer (14), bearing (15) and bearing retainer (16) off pan bearing shaft (24).

14 To dismantle the pan mechanism:

14.1 Remove eight screws (28) which secure pan brake disc (18) to base ring (21). Carefully lift main body casting (Fig 6.2 item 43) off base ring and thrust bearing assembly. Pan brake disc (18) will be drawn off dowels (27) as the body is lifted. Do not attempt to remove dowel pins (27) which are secured in position with Loctite.

14.2 Remove thrust washer (19), needle roller thrust bearing (20) and second thrust washer (19) from base ring (21).

14.3 Remove three dowel pins (39) from pan bearing shaft.

14.4 If required, pan bearing shaft (24) may be separated from base ring (21) by removing two screws (26) and pushing it downwards. Two stainless steel dowel pins (25) may be left in position in base ring.

14.5 Access to bearing (15) and Omniseal (13) may be obtained by removing six screws (17) which secure bearing retainer (16) to pan drag housing (11).

14.6 Remove Spirol pin (38) to allow pan drag shaft (6) to be withdrawn from drag shoe (8). Discard Spirol pin (38) and fit a new one on reassembly.

14.7 If required, tap guide bush (34) sharply inwards with a soft wood drift to break the Loctite seal, press the bush into the recess in the pan drag housing and remove.

## Assembly

### Pan mechanism

15 To assemble the pan mechanism ([Fig 6.3](#)):

15.1 Clean all components, particularly those which have been in contact with Vinten Fluid No. 3.

15.2 If guide bush (34) has been removed, degrease bore in pan drag housing (11) and outside diameter of guide bush. Apply Loctite 380 to outside diameter of guide bush (34) and install bush in bore in pan drag housing. Use sufficient Loctite to ensure that an air-tight seal is formed between guide bush (34) and pan drag housing (11).

15.3 Degrease threads of six screws (17), prime with Loctite Activator `T' and allow to dry.

15.4 Degrease six tapped holes in lower face of pan drag housing (11).

15.5 Lay pan drag housing (11) upside down on a clean surface and apply a thin film of white bearing grease to the 46mm (1.8in.) dia bore and chamfer for the Omniseal. Locate Omniseal (13), seal retainer (14) and bearing (15) in recess in pan drag housing. Position bearing retainer (16) on bearing and turn to align screw holes with corresponding holes in pan drag housing.

15.6 Apply Loctite 222E to threads of screws (17) and secure bearing retainer (16) to pan drag housing (11). Ensure that bearing (15), seal retainer (14) and flange of Omniseal (13) are correctly seated in recess before tightening screws.

15.7 If pan bearing shaft (24) has been separated from base ring (21), degrease threads of two screws (26), prime with Loctite Activator `T' and allow to dry.

15.8 Degrease two tapped holes in flange of pan bearing shaft (24). Insert pan bearing shaft (24) into base ring (21) and locate flange on two dowel pins (25) in base ring (21).

15.9 Apply Loctite 222E to threads of screws (26) and secure pan bearing shaft (24) to base ring (21). Ensure that ends of dowels (25) do not project above face of recess in base ring (21).

15.10 Degrease threads of eight screws (28), prime with Loctite Activator `T' and allow to dry.

15.11 Degrease eight tapped holes in upper face of base ring (21) and secure it to a suitable support using four bolts (23) and washers (22).

15.12 Apply white bearing grease to needle roller thrust bearing (20) and to running faces of two thrust washers (19). Assemble one thrust washer (19), thrust bearing (20) and second thrust washer (19) onto base ring (21).

15.13 Position main body ([Fig 6.2](#) item 49) on thrust bearing.

- 15.14 Identify correct holes for dowel pins in pan brake disc (18) and locate it on two dowel pins (27) in base ring (21).
- 15.15 Apply Loctite 222E to threads of screws (28) and secure pan brake disc (18) to base ring (21).
- 15.16 Install pan drag housing (11), complete with bearing retainer (16), bearing (15), seal retainer (14) Omniseal (13) and guide bush (34), onto pan bearing shaft (21), ensuring that housing is correctly oriented relative to main body so that guide bush (34) aligns with cutout in main body.
- 15.17 Secure pan drag housing to main body using four screws (12).
- 15.18 Apply white bearing grease to two `O' rings (29) and to two wide grooves in pan drag actuator (30). Install `O' rings in wide grooves in pan drag actuator.
- 15.19 If disassembled, screw locknut (33) onto pan drag knob (32) until about 15mm of thread projects from the locknut. Screw the pan drag knob into pan drag actuator (30) until the locknut almost touches the end face of the pan drag actuator. Tighten the locknut against the pan drag actuator.
- 15.20 Insert pan drag actuator (30) into bore of guide bush (34) and push it in until it just projects from the inner face of guide bush (34).
- 15.21 If removed, insert pan drag shaft (6) into pan drag shoe (8) and install Spirol pin (38) to retain it in position. Assemble pan drag shoe (37) and thrust washer (36) onto pan drag shaft.
- 15.22 Lay one washer (9) over each hole for drag shoe pivot pin (7) in bottom of pan drag housing (11).
- 15.23 Lay assembly of pan drag shoes (8) and (37), pan drag shaft (6) and thrust washer (37) into recess in pan drag housing (11), ensuring that end of pan drag shaft (6) enters tapped bore of pan actuator. Turn pan drag knob (32) clockwise to start thread of pan drag shaft (6) in pan drag actuator. Turn pan drag knob clockwise until pan drag shoes can be positioned for installation of pivot shafts.
- 15.24 Position each drag shoe so that hole for pivot pin aligns with hole in washer (9) and corresponding hole in pan drag housing. Insert drag shoe pivot pins (7) and ensure that each pin passes through washer (9) and is pushed fully home in pan drag housing (11).
- 15.25 Turn pan drag knob counter-clockwise to allow pan drag shoes to separate fully within constraint of pan drag housing.
- 15.26 Smear faces of pan drag shoes (8) and (37) with Vinten Fluid No. 3.
- 15.27 Degrease threads of screw (3), prime with Loctite Activator `T' and allow to dry.
- 15.28 Degrease tapped hole in upper face of pan bearing shaft (24).
- 15.29 Apply a thin film of white bearing grease to the chamfer and 40mm (1.6in.) sealing diameter of pan drag drum (5).
- 15.30 Position pan drag drum (5) on pan bearing shaft (24) and turn to align holes for dowel pins (39). Insert three dowel pins (39) in pan drag drum and push down until the ends are level with the recess in pan drag drum.
- 15.31 Place clamp washer (4) in recess in pan drag drum (5).
- 15.32 Apply Loctite 270 to threads of screw (3) and start in pan bearing shaft (24).
- 15.33 Tighten screw (3) to a torque setting of 5.65 Nm (50 lbf in.).

- 15.34 Check that pan axis operates smoothly without shake or noise.
- 15.35 Release screw (3) then tighten to a torque setting of 3.39Nm (30lbf.in.).
- 15.36 Turn pan drag knob (32) clockwise until circlip groove in pan drag actuator (30) is clear of inner face of guide bush (34) and install a new circlip (35).
- 15.37 Completely fill pan drag housing (11) with Vinten Fluid No. 3, allowing time for trapped air bubbles to escape.
- 15.38 Place two washers (9) on each pan drag shoe pivot pin (7).
- 15.39 Position gasket (10) and cover (2) on pan drag housing, ensuring that notches in cover, gasket and housing are aligned.
- 15.40 Secure cover to pan drag housing using six screws (1) but do not tighten screws at this stage.
- 15.41 Fit a new 'O' ring (40) into groove in pan brake shaft (41) and screw pan brake shaft into pan drag housing cover. Screw in brake shaft (41) by hand until it stops and then back it off about half a turn.
- 15.42 Tighten six screws (1).
- 15.43 Progressively turn pan drag knob (32) clockwise until the head develops a pan drag torque of 18.0Nm when tested at 0.4 radians/second (1/16 turn per second).
- 15.44 Without disturbing the position of pan drag actuator (30), back off locknut (33) and carefully unscrew knob (32) complete with locknut (33).
- 15.45 Screw locknut as far as possible along thread of knob. Degrease threads of actuator (30) and knob (32). Apply Loctite Primer 'T' to threads of knob (32) and allow to dry.
- 15.46 Apply Loctite 638 to threads of knob (32). Without disturbing the position of pan drag actuator (30), screw knob into the actuator until it meets a stop. Tighten locknut (33) against actuator (30). Paint the interface of locknut (33) and actuator (30) with red paint.
- 15.47 Allow Loctite to cure and turn knob (32) counter-clockwise to unload the pan drag.
- 15.48 Turn pan brake shaft (41) clockwise to a torque of 5.08 Nm (45lbf.in.).
- 15.49 Referring to [Fig 6.2](#) install pan brake lever boss (65) on brake shaft ([Fig 6.3](#) item 41) but do not tighten screw (57).
- 15.50 Referring to [Fig 6.2](#) position brake guard (51) on body (49) and secure with four screws (50).
- 15.51 Move pan brake lever to limit of travel at LH side of brake gate and tighten screw ([Fig 6.2](#) item 57).

## Guide bar pins

- 16 To assemble the guide bar pins ([Fig 6.2](#)):
- 16.1 Degrease threaded bore of parking bar (36) and thread of location plug (40), prime threads with Loctite primer 'T' and allow to dry.

16.2 Apply Chesterton grease ([Section 3](#)) to 'O' ring (37) and install in groove near outer end of bore of parking bar sleeve (38).

16.3 Push parking bar (42) into parking bar sleeve as far as possible.

16.4 Fit stop plate (39) onto location plug (40), apply Loctite 270 to threads and screw into parking bar (36). Allow Loctite to cure.

17 To install the guide bar pins ([Fig 6.2](#)):

17.1 Screw parking bar sleeve (38) with assembled guide bar pin into threaded hole in side of body (43) below cam follower assembly.

17.2 Ensure that guide bar pin is pulled out to full extent.

## Cam followers

18 To install the cam followers ([Fig 6.2](#)):

18.1 Install two cam roller shafts (31) on body (43) and secure each with two screws (32).

18.2 Install a cam follower assembly (33) on each cam roller shaft and secure with a cam roller cover (34) and screw (35).

## Adjustable guide bar rollers

19 There are four adjustable guide bar rollers at the front end of the head. To install the rollers ([Fig 6.2](#)):

19.1 Install four guide roller eccentric shafts (56) in body (43) and lightly secure each with a clamp plate (55) and three screws (32). Position the guide roller eccentric shafts (56) to leave maximum gap between fixed rollers and adjustable rollers until platform is installed.

19.2 Install a bearing (57) on each guide roller shaft and secure with a washer (58) and screw (59).

19.3 Refit roller covers (28) and (60) and secure each with two screws (27).

## Fixed guide bar rollers

20 There are four fixed guide bar rollers at the rear end of the head. To install the rollers ([Fig 6.2](#)):

20.1 Install four guide roller shafts (54) in body (43) and secure each with two screws (32).

20.2 Install a bearing (57) on each guide roller shaft and secure with a washer (58) and screw (59).

20.3 Refit roller covers (49) and (53) and secure each with two screws (27).

## Cam bolts

21 To install the cam bolts ([Fig 6.2](#)):

21.1 Ensure Spirol pin (24) is secure in locking shaft (23) and end cap (25) is fitted.

21.2 Install locking shaft (23) in cam bolt bracket (20). Degrease grub screw (22) and apply Loctite 222E to thread. Fit grub screw to bracket so that it engages in gate in locking shaft (23). Tighten grub screw sufficiently to allow free movement of locking pin.

21.3 Lubricate locating ball (19) and spring (18) with white bearing grease and install in lock bracket.

21.4 Secure each cam bolt bracket (20) to body (43) with two screws (21).

## Tilt brake assembly

22 To install the tilt brake assembly ([Fig 6.2](#)):

22.1 Degrease pivot shaft (11) and corresponding bore in fixed tilt brake assembly (14). Apply Loctite primer `T' to shaft (11) and allow to dry. Install pivot shaft (11) centrally in fixed tilt brake assembly (14) using Loctite 601. Allow to cure.

22.2 Degrease four screws (17), apply Loctite primer `T' and allow to dry. Assemble two spring plates (16) and spring (15) on brake assemblies (5) and (14) and secure with four screws (17) using Loctite 222E. Do not tighten screws at this stage.

22.3 Use setting plate T23236 between the brake assembly friction faces to ensure squareness whilst tightening four screws (17).

22.4 Install washer (4) on eyebolt (3), pass shank of eyebolt through tilt brake assemblies (5) and (14) and secure with washer (12) and nut (13). Tighten nut (13) only to point at which jaws of tilt brake are a very free fit on tilt brake cam (9).

22.5 Install shims (10) on each end of shaft (11) as noted during disassembly and install tilt brake assembly in body.

22.6 Grease bores and threads of two pivot screws (29) with white bearing grease and screw into body. If necessary, insert or remove shims (10) to eliminate end float between tilt brake assembly (14) and end faces of pivot screws (29) when pivot screws are fully tightened.

22.7 Engage brake lever fork (52) on eyebolt (3) and fit tilt brake pin (2). Secure with a new split pin (1).

22.8 Adjust tilt brake ([See "Taking up wear in the tilt brake" on page 20](#)) after fitting platform ([Para 26](#)).

## Tilt drag unit

23 To assemble the tilt drag unit ([Fig 6.2](#)):

23.1 Clean all components, particularly those which have been in contact with Vinten Fluid No. 3.

23.2 Install bearing (77) in tilt drag housing (66) using Loctite 641.

23.3 If tilt housing bush (84) has been removed, degrease bore in tilt drag housing (66) and outside diameter of guide bush. Apply Loctite 380 to outside diameter of housing bush (84) and install bush in bore in tilt drag housing. Use sufficient Loctite to ensure that an air-tight seal is formed between bush (84) and tilt drag housing (66). Note that bush is installed outwards from housing cavity.

23.4 Install tilt shoe pivot pins (73) in tilt housing (66). Lubricate pivot pins (73) with white bearing grease and install two washers (71) on each pivot pin.

23.5 Lubricate threads of tilt drag actuator shaft assembly (72) with white bearing grease ([Section 3](#)) and pass threaded part through hole in tilt drag shoe assembly (70). Install a new Spirol pin (81) in the tilt drag shoe assembly to retain drag actuator shaft in position. Drive Spirol pin (81) into tilt drag shoe to leave 6mm protruding.

23.6 Assemble tilt drag shoe assembly (92) and thrust washer (82) onto actuator shaft.

23.7 Install tilt drag shoes complete with actuator shaft and thrust washer onto pivot pins (73) in housing, ensuring that projecting threaded part of drag actuator shaft is towards housing bush (84).

23.8 Lubricate two 'O' rings (85) with white bearing grease ([Section 3](#)) and install on tilt drag actuator (86). Lubricate threaded bore of tilt drag knob assembly with white bearing grease.

23.9 Insert tilt drag actuator into tilt housing bush (84) and screw onto tilt actuator shaft for about four turns.

23.10 Separate tilt drag shoes as far as possible and apply a coating of Vinten Fluid No. 3 to the friction facings.

23.11 Lubricate two 'O' rings (80) with white bearing grease and install on shaft of tilt drag drum (90). Install tilt drag drum in tilt drag housing, slackening tilt drag adjustment knob if necessary.

23.12 Install a new circlip (83) in groove on tilt drag actuator (86).

23.13 Install bearing (77) in cover (75) and secure with Spirol ring (78).

23.14 Use a syringe to place 50ml of Vinten Fluid No. 3 in the tilt drag housing (66) and allow to settle.

23.15 Fit one washer (71) on each pivot pin (73).

23.16 Fit gasket (74) to cover (75). Secure cover to housing (66) with seven screws (79).

23.17 Install bleed screw (76) in cover (75) using Loctite 222E.

24 To install the tilt drag unit:

24.1 Referring to [Fig 6.2](#) secure the tilt drag unit to LH guide bar (64) using four screws (62) and Loctite 222E. Do not tighten screws (81) at this stage.

24.2 Referring to [Fig 6.1](#) install link bar (31), arm and bracket assembly on shaft of tilt drag unit. Do not tighten screw (30) at this stage.

24.3 Secure hinge ([Fig 6.4](#) item 68) to platform (38) using two screws (10). Fully tighten screws (10).

24.4 Secure link bracket (23) to platform (38) with two screws (8).

24.5 Temporarily install the platform on the head ([Para 26](#)). Rock the platform to and fro several times to align bearings. Carefully remove the platform from the head and fully tighten four screws ([Fig 6.2](#) item 62) which secure tilt drag unit to LH guide bar.

24.6 Tighten screw (30) and adjust screws (26) and (29) after installation of platform.

## Platform

25 To assemble the platform (Fig 6.1):

25.1 Degrease two holes for dowel pins in each pan bracket (19) and corresponding holes in platform (38). Degrease two dowel pins (22) for each pan bracket.

25.2 Apply Loctite 601 to dowel pins (22), assemble pan bracket (19) and dowel pins (22) to platform and secure each with four screws (21). Ensure that dowel pins are flush to face of pan bracket.

25.3 Apply white bearing grease to adjusting screw (7) and screw into adjusting bush (11) to middle of threaded part. Clean grease from about 80mm (3in.) of the rear end of the adjusting screw (end without the collar).

---

**NOTE: Collar (6) is at front end of adjusting screw**

---

25.4 Degrease hole for adjusting screw bush (34) in rear end of trough in platform (38).

25.5 Offer adjusting screw to platform trough with collar towards front. Position adjusting bush (11) so that end with tapped hole will face upwards. Feed rear end of adjusting screw through hole in rear end of platform until front end of screw can be lowered into trough and fed forwards into bearing in front end of platform.

25.6 Degrease outside of bush (34), apply a small quantity of white bearing grease to the bore, fit bush onto adjusting screw (7) and secure in platform (38) with Loctite 601. Bush should be positioned so that adjusting screw turns freely but has minimum axial play.

25.7 Install two knobs (4) on adjusting screw (11) and secure each knob with a Spirol pin (2).

25.8 Referring to Fig 6.2, locate hinge (68) in tilt drag housing (66) and secure with bracket pin (67) and grub screw (91). Ensure that flat on pin faces grub screw.

25.9 Install bearing (65) centrally in LH guide bar (64).

25.10 Install guide bar buffer (61) in LH guide bar.

25.11 Secure LH guide bar (64) to tilt drag unit using four screws (62) and Loctite 222E. Do not tighten screws at this stage.

25.12 Install shims (63) on the LH guide bar (64) as noted during disassembly. Referring to Fig 6.1, fit LH guide bar and tilt drag unit to platform assembly and secure with guide bar pin (13) and grub screw (12). Ensure that flat on pin faces grub screw.

25.13 Secure hinge (Fig 6.2 item 68) to platform (38) with two screws (10). Fully tighten screws (10).

25.14 Install link bracket (23) in link arm (28), fitting one shim (25) on each side of the bracket and secure with dowel pin (27) and grub screw (32). Install link bar (31) in link arm (28), fitting one shim (25) on each side of the bar and secure with dowel pin (27) and grub screw (32).

25.15 Install link bar (31), arm and bracket assembly on shaft of tilt drag unit (Fig 6.2 item 86). Do not tighten screw (30) at this stage.

25.16 Secure link bracket (23) to platform (38) with two screws (8).



25.17 Referring to [Fig 6.2](#), install bearing (65) centrally in RH guide bar (26).

25.18 Install guide bar buffer (61) in RH guide bar.

25.19 Referring to [Fig 6.1](#), install RH guide bar on platform assembly and secure with guide bar pin (13) and grub screw (12). Ensure that flat on pin faces grub screw.

25.20 Temporarily install the platform on the head ([Para 26](#)). Rock the platform to and fro several times to align bearings. Carefully remove the platform from the head and fully tighten four screws ([Fig 6.2](#) item 62) which secure tilt drag unit to LH guide bar.

25.21 Referring to [Fig 6.2](#), install tilt brake cam plate (9) on platform and loosely secure with four screws (6), washers (7) and nuts (8).

25.22 Referring to [Fig 6.1](#), if dowel pins (17) have been removed, degrease holes for dowel pins in each side of platform (37), degrease four dowel pins (17) and secure in platform with Loctite 601. Remove surplus Loctite from exposed part of dowel pins.

25.23 Install two cam plates (16) on dowel pins (17) and secure to platform with four screws (18).

25.24 Secure carrying handle (14) to front end of cam plates (16) with two screws (15).

26 To install the platform ([Fig 6.2](#)):



**WARNING!: Do not allow platform assembly to drop sharply onto cam followers.**

26.1 Clean fore and aft faces of guide bars (26) and (64), profiled faces of cams ([Fig 6.1](#) item 16), guide rollers (57) and cam followers (33).

26.2 With the aid of an assistant, lower platform into position, guiding tilt lock cam plate into position in tilt brake assembly and guide bars between guide bar rollers. Do not allow platform assembly to drop sharply onto cam followers.

26.3 Referring to [Fig 6.2](#) install two guide bar stops (30) and washers (12) to retain platform.

26.4 With the aid of an assistant, raise platform to its highest position and chock securely.

26.5 Adjust guide rollers ([See "Elimination of fore and aft play in the guide bars." on page 22](#)) after fitting platform.

26.6 Gently apply tilt brake to centralize tilt lock cam plate (9). Fully tighten four nuts (8) and screws (6).

26.7 Adjust tilt lock ([See "Taking up wear in the tilt brake" on page 20](#)).

26.8 Referring to [Fig 6.1](#), tighten screw (30) to secure link bar (31) to tilt drag unit and tighten screws (29) and (26) sufficiently to minimize clearances in bearings (24).

26.9 Referring to [Fig 6.1](#), install sliding plate (39) in platform (38) and secure to adjusting bush (11) with screw (9).

---

26.10 Screw sliding plate clamp lever (41) into platform. Install clamp block (40) and plate (42) and secure with two screws (10).

26.11 Adjust clamp by pulling lever outwards against its spring, rotating counter-clockwise and releasing. Repeat until clamp locks when applied but allows free movement when released. Check action of clamp at several positions along length of sliding plate travel.

26.12 Refit wedge adaptor to sliding plate in position noted during disassembly ([See "Repositioning the wedge adaptor" on page 23](#)).

## Section 6

# Illustrated Parts List

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## Introduction

1 This parts list is issued for the Mk 7B LF Cam Head, manufactured by Vinten Broadcast Limited, Western Way, Bury St. Edmunds, Suffolk, IP33 3TB, England.

2 The Mk 7B LF Cam Head is available in 13 versions, each designed to balance a payload with a specific C of G height ([Table 6.1](#)). The versions differ only in the profile of the cam plates fitted.

## Ordering spare parts

3 When ordering a spare part, please quote the part number, NOT the item number.

4 Certain items form part of -900SP series composite spare parts. These are detailed in [Fig 6.5](#) and are indicated in the parts list by an asterisk (\*) against the part number

5 Due to restrictions placed on the transportation of adhesives and other materials, please obtain supplies of consumable materials from your local distributor.

## Main assembly part numbers

6 Ensure that the correct serial and part numbers are quoted when ordering main assemblies.

Assembly	Part No.
Carrying Case	3118-3
Pan Bar Assembly (Fig 6.4)	3219-62
Short Pan Bar Assembly (Fig 6.4)	3219-67
Fixed Pan Bar Assembly (Fig 6.4)	3219-66

## Cam plate details

7 The Mk 7B Cam Head is designed to support a variety of cameras, lenses and prompters in perfect balance over a tilt range of  $\pm 44.5^\circ$  to  $\pm 60^\circ$ , dependent on the centre of gravity height of the payload.

Mk 7B LF Cam Head Part No.	Cam plate Part No.	C of G Height of Payload		Maximum Tilt Angle (Degrees)
		(mm)	(in.)	
3388-3M	3084-311*	101.6	4.0	$\pm 55.0$
3388-3N	3084-310*	114.3	4.5	$\pm 54.0$
3388-3B	3084-284	127.0	5.0	$\pm 60.0$
3388-3C	3084-305	139.7	5.5	$\pm 57.5$
3388-3D	3084-285	152.4	6.0	$\pm 55.5$
3388-3E	3084-306	165.1	6.5	$\pm 53.5$
3388-3F	3084-286	177.8	7.0	$\pm 52.5$
3388-3G	3084-307	190.5	7.5	$\pm 50.5$
3388-3H	3084-287	203.2	8.0	$\pm 49.0$
3388-3J	3084-308	215.9	8.5	$\pm 48.0$
3388-3P	3084-312	228.6	9.0	$\pm 46.0$
3388-3K	3084-309	241.3	9.5	$\pm 45.5$
3388-3L	3084-288	254.0	10.0	$\pm 44.5$

\*Cam plates 3084-311 and 3084-310 increase platform height by 12.7 mm (0.5 in.)

**Table 6.1**  
**Mk 7B LF Cam Head versions**

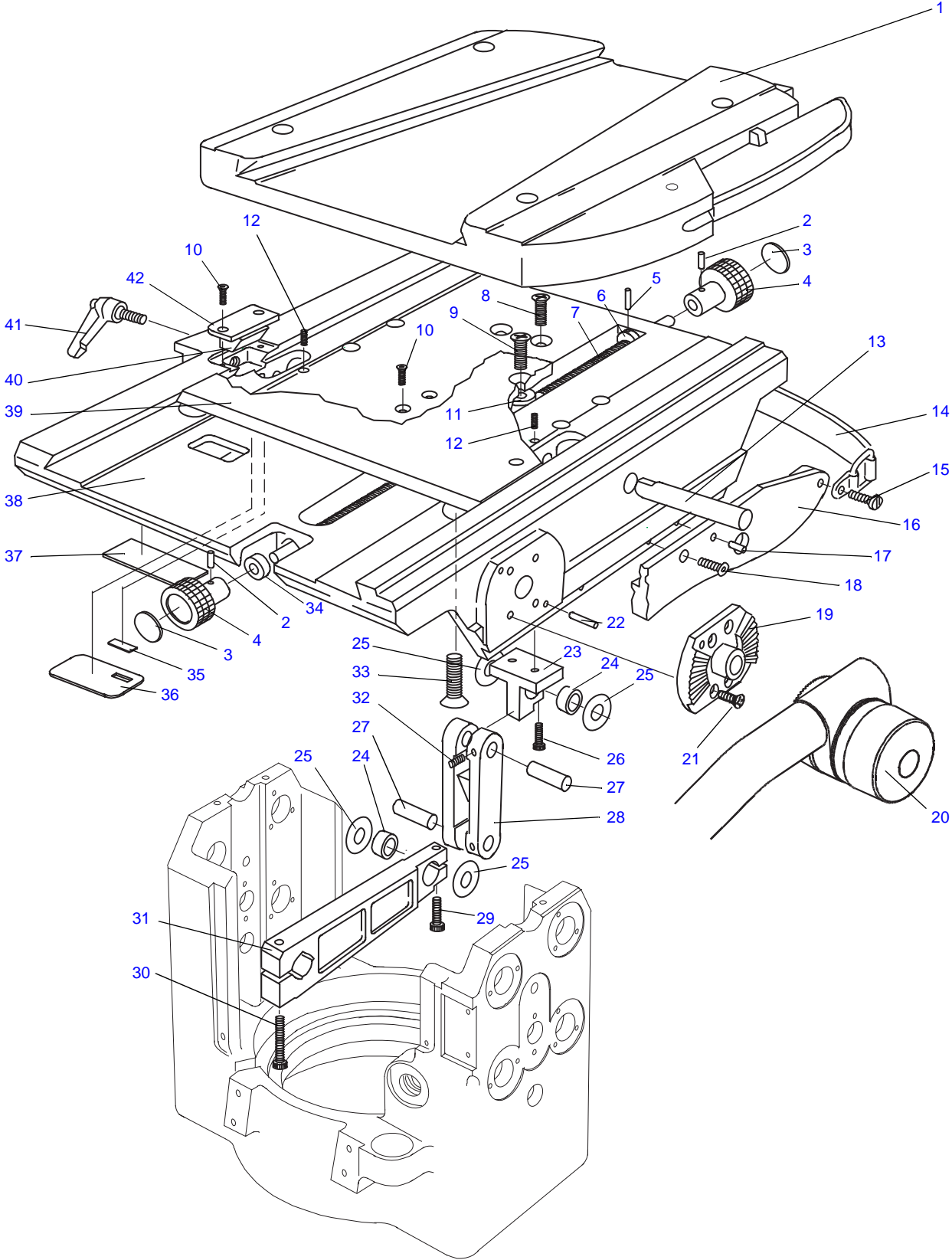


Fig 6.1 Mk 7B Cam Head - Platform Assembly

3388IP01

**Fig 6.1 Mk 7B Cam Head - Platform Assembly**

Item	Part No.	Nomenclature	Qty
1	3389-3	Wedge adaptor assembly	1
2	M806-027	Pin, coiled-spring, 3 mm dia. x 14 mm long, mdp	2
3	3388-276	Adjusting label	2
4	3388-267	Adjusting screw knob	2
5	M806-001	Pin, coiled-spring, 3 mm dia. x 12 mm long, hcp	1
6	3277-207	Collar	1
7	3388-266	Adjusting screw	1
8	M007-113	Screw, countersunk head, pozidrive, M6 x 10 mm long	2
9	M008-903	Screw, countersunk head, socket, M8 x 16 mm long	1
10	M005-912	Screw, countersunk head, socket, M4 x 10 mm long	4
11	3277-205	Adjusting bush	1
12	M005-804	Screw, grub, dog point, socket head, M4 x 10 mm long	2
13	3084-292	Guide bar pin	2
14	3084-13	Carrying handle assembly, attached by:	1
	3277-232	Plate	2
15	3426-78	Carrying handle screw	2
16	3084-CAM	Cam ( <a href="#">Table 6.1</a> )	2
17	M801-004	Pin, dowel, 4 mm dia. x 12 mm long	4
18	M006-205	Screw, countersunk head, slotted, M5 x 12 mm long	8
	3277-14	Pan bracket assembly, comprising:	2
19	3277-227	Pan handle bracket	1
NI	L850-036	Threaded-insert, wire thread insert (helicoil), 3/8 in. BSF x 1-1/2 Diameters long	
20	3219-62	Pan bar and clamp assembly ( <a href="#">Fig 6.4</a> )	1
21	M006-904	Screw, countersunk head, socket, M5 x 16 mm long	8
22	M801-007	Pin, dowel, 4 mm dia. x 20 mm long	4
23	3388-264	Link bracket	1
24	N500-001	Bearing, needle roller, radial, full complement, 5/16 in. ID x 1/2 in. OD x 3/8 in. long	2
25	3388-291	Link bracket shim	4
26	M005-514	Screw, button head, socket, M4 x 16 mm long	1
27	M801-029	Pin, dowel, 8 mm dia. x 30 mm long	2

**Fig 6.1 Mk 7B Cam Head - Platform Assembly (Cont)**

Item	Part No.	Nomenclature	Qty
28	3388-252	Link arm (tilt)	1
29	M006-514	Screw, button head, socket, M5 x 16 mm long	1
30	M006-503	Screw, button head, socket, M5 x 25 mm long	1
31	3388-265	Link bar (tilt)	1
32	M005-801	Screw, grub, dog point, socket head, M4 x 5 mm long	2
33	M008-905	Screw, countersunk head, socket, M8 x 25 mm long	4
34	3277-208	Bush	1
35	3388-278	Serial no. label	1
36	3423-11	Serial number label for Mk7B (2" long black on silver)	1
37	3388-288	Velcro pad (hooks)	1
38	<a href="#">3388-203*</a>	Platform	
NI	<a href="#">M850-005*</a>	Threaded-insert, wire thread insert (helicoil), M6 x 1-1/2 Diameters long	1
39	3277-203	Slide plate	1
40	3277-210	Clamp block	1
41	J402-043	Lever, clamp, 40 mm long, M6, male thread	1
42	3388-299	Clamp plate	1

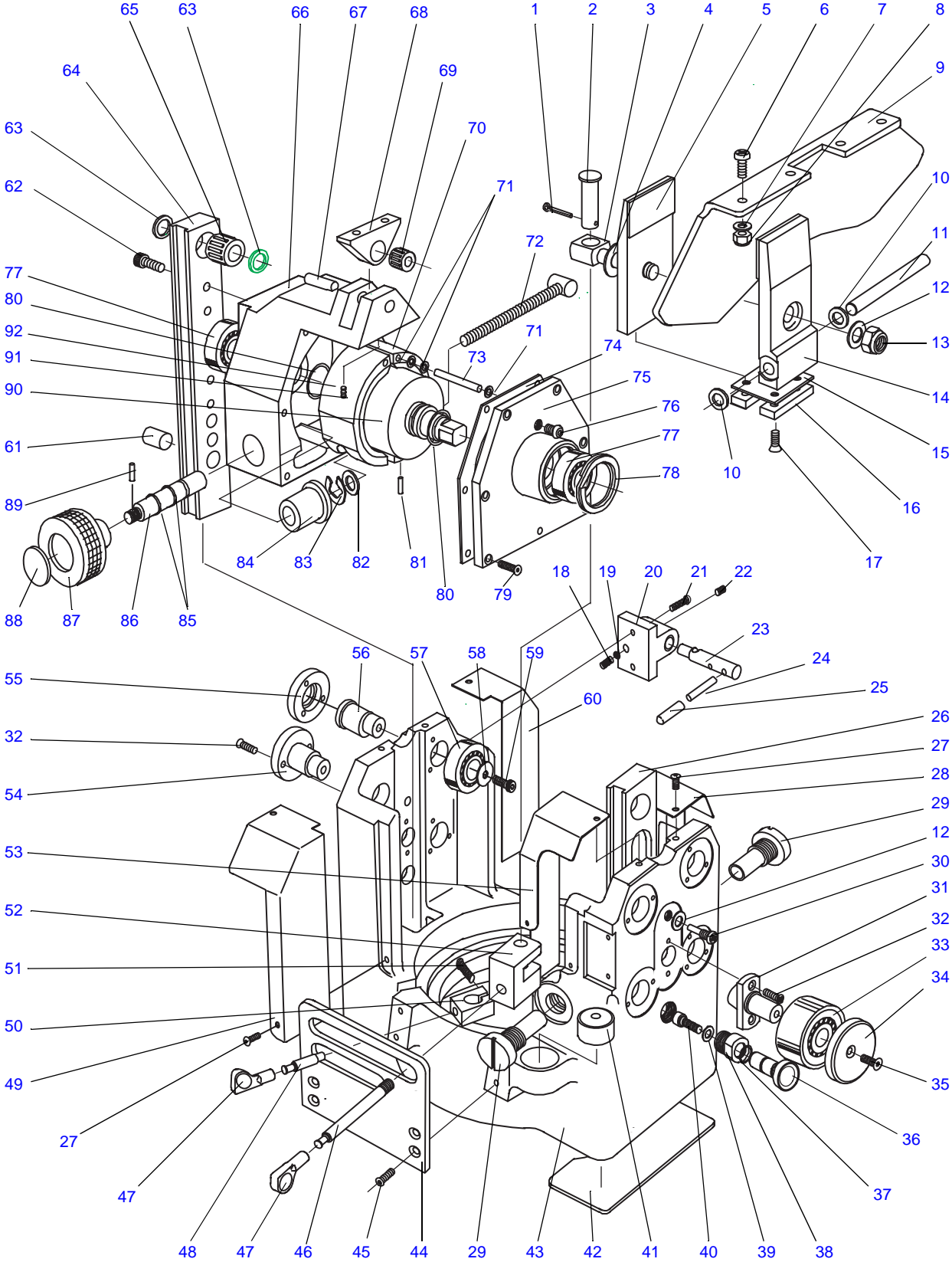


Fig 6.2 Mk 7B Cam Head - Body Assembly

3388IP02



**Fig 6.2 Mk 7B Cam Head - Body Assembly**

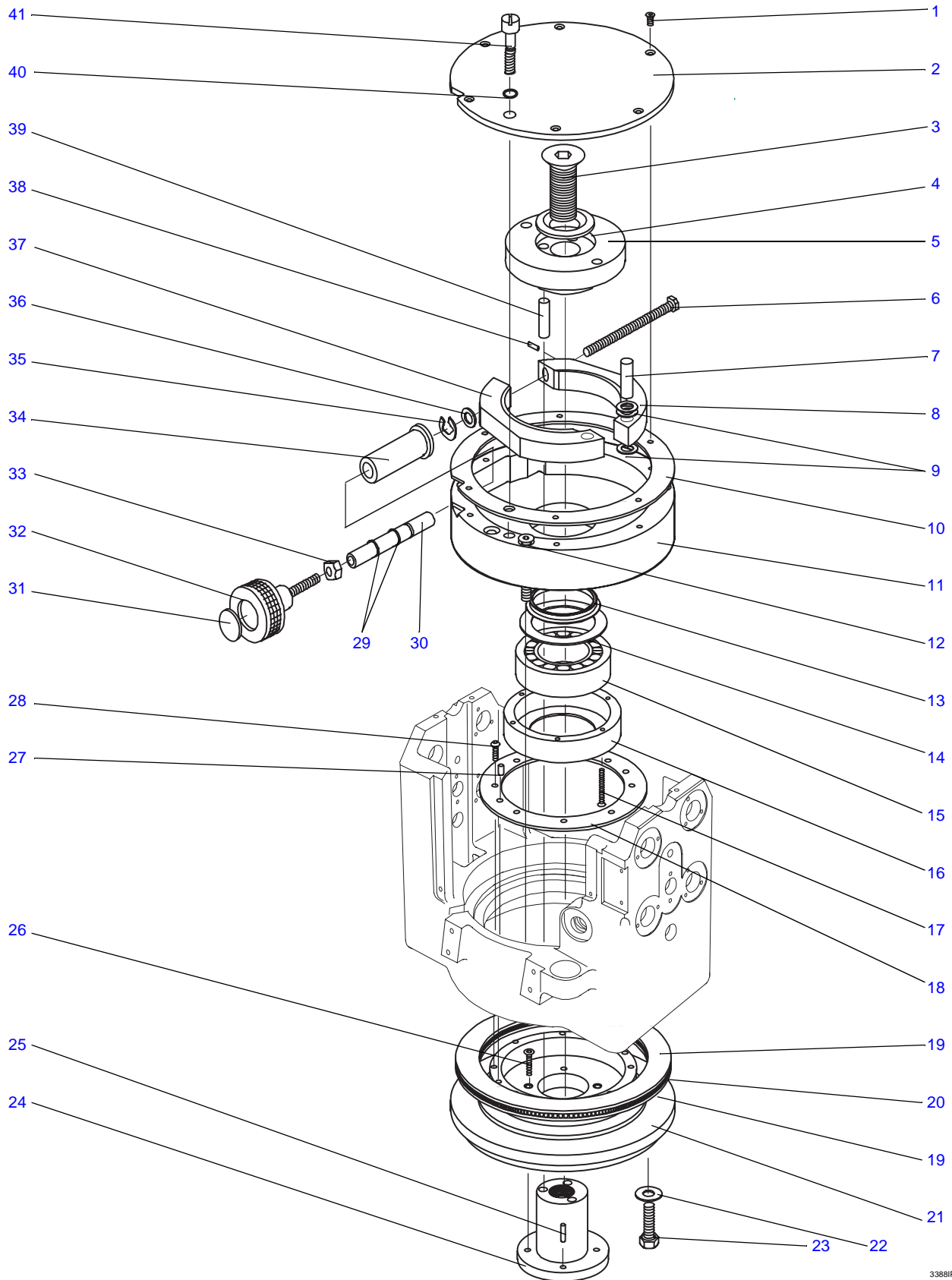
Item	Part No.	Nomenclature	Qty
1	L806-004	Pin, split, 1/16 in. dia. x 1/2 in. long	1
2	3084-296	Tilt brake pin	1
3	3084-261	Eye bolt (tilt lock)	1
4	3084-262	Washer (tilt lock)	1
5	3388-19	Tilt brake assembly (clamp)	1
6	M006-013	Screw, pan head, pozidrive, M5 x 16 mm long	4
7	M600-006	Washer, plain, heavy, M5	4
8	M501-008	Nut, M5, nyloc, full	4
9	3084-289	Cam plate	1
10	3277-231	Shim	A/R
11	3084-258	Shaft (tilt lock)	1
12	M600-009	Washer, plain, heavy, M8	3
13	M501-016	Nut, M8, nyloc, full	1
14	3388-20	Tilt brake assembly (fixed)	1
15	3084-254	Spring (tilt lock)	1
16	3084-255	Spring plate (tilt lock)	2
17	M006-102	Screw, countersunk head, pozidrive, M5 x 8 mm long	4
18	J532-048	Spring, compression, 3/4 in. free length, 3/16 in. OD, 1.5 lbf/in. rate	2
19	N600-001	Ball, steel, 3/16 in. dia.	2
20	3084-248	Platform lock bracket	2
21	M007-503	Screw, button head, socket, M6 x 15 mm long	4
22	M007-810	Screw, grub, dog point, socket head, M6 x 6 mm long	2
23	3388-277	Locking bar	2
24	M806-012	Pin, coiled-spring, 5 mm dia. x 35 mm long, mcp	2
25	J553-033	Cap, tube, heat-shrinkable type	2
26	3277-224	Guide bar (right hand)	1
27	M005-513	Screw, button head, socket, M4 x 6 mm long	8
28	3388-275	Roller cover - right hand. front	1
29	3388-245	Pivot screw (tilt lock)	2
30	3084-209	Guide bar stop	2
31	3388-283	Cam roller shaft	2
32	M006-113	Screw, countersunk head, pozidrive, M5 x 12 mm long	24

**Fig 6.2 Mk 7B Cam Head - Body Assembly (Cont)**

Item	Part No.	Nomenclature	Qty
33	3084-35	Cam roller assembly	2
34	3277-218	Cam roller cover	2
35	M005-903	Screw, countersunk head, socket, M4 x 12 mm long	2
36	3388-279	Parking bar	2
37	<a href="#">R900H052*</a>	'O'-Ring, 12 mm ID x 3.00 mm section, hardness 70 IRHD	2
38	3388-280	Parking bar sleeve	2
39	3388-285	Stop plate	2
40	3388-286	Location plug	2
41	J501-010	Level-bubble, sensitivity 30, Level Dev. no. PV20	1
42	3388-256	Cover	2
43	3388-202	Main body	1
44	3388-271	Brake gate	1
45	M005-912	Screw, countersunk head, socket, M4 x 10 mm long	4
46	3388-241	Shaft tilt lock	1
47	3388-269	Paddle	2
48	3388-242	Shaft pan lock	1
49	3388-272	Roller cover - left hand. rear	1
50	3388-290	Boss (pan lock)	1
51	M006-514	Screw, button head, socket, M5 x 16 mm long	1
52	3084-295	Tilt brake fork	1
53	3388-274	Roller cover - right hand. rear	1
54	3388-240	Guide roller shaft	4
55	3388-239	Clamp plate	4
56	3388-238	Guide roller eccentric	4
57	P200-243	Bearing, ball, radial, 12 mm ID x 32 mm OD x 10 mm long, two seals	8
58	3084-204	Washer	8
59	M005-716	Screw, cap head, socket, M4 x 8 mm long	8
60	3388-273	Roller cover - left hand. front	1
61	3084-208	Guide bar buffer	2
62	M006-703	Screw, cap head, socket, M5 x 12 mm long	4
63	3084-294	Shim (platform pivot)	2
64	3277-225	Guide bar (left hand)	1

**Fig 6.2 Mk 7B Cam Head - Body Assembly (Cont)**

Item	Part No.	Nomenclature	Qty
65	P203-013	Bearing, needle roller, radial, 10 mm ID x 14 mm OD x 15 mm long	2
	3388-10	Tilt drag assembly, comprising:	1
66	3388-201	Tilt drag housing	1
67	3277-216	Bracket pin	1
68	3388-235	Hinge	1
69	N500-001	Bearing, needle roller, radial, full complement, 5/16 in. ID x 1/2 in. OD x 3/8 in. long	1
70	3388-12	Tilt drag shoe assembly - rear	1
71	M600-004	Washer, plain, heavy, M4	6
72	3388-13	Tilt drag actuator shaft assembly	1
73	3388-270	Tilt shoe pivot pin	2
74	<a href="#">3388-234*</a>	Tilt housing gasket	1
75	3388-231	Tilt drag housing cover	1
76	M005-511	Screw, button head, socket, M4 x 8 mm long	1
77	P200-202	Bearing, ball, radial, 17 mm ID x 35 mm OD x 10 mm long, one seal	2
78	L700-010	Spiral retaining ring, internal, medium duty x 1.375 in. bore dia. x 0.043 in. thick	1
79	M004-910	Screw, countersunk head, socket, M3 x 12 mm long	7
80	<a href="#">Q500-050*</a>	'Omniseal', 20.0 mm shaft dia. x 2.3 mm nominal section	2
81	L800-034	Pin, coiled-spring, 3/32 in. dia. x 1/2 in. long, mcp	1
82	3388-233	Thrust washer	1
83	M701-052	'E'-Clip, standard, 10.50 mm shaft dia. x 1.00 mm thick	1
84	3388-228	Tilt housing bush	1
	3388-14	Tilt actuator knob assembly, comprising:	1
85	<a href="#">Q001-012*</a>	'O'-Ring, 5/16 in. nominal ID x 0.070 in. section, hardness 70 IRHD	2
86	3388-230	Tilt drag actuator	1
87	3388-227	Tilt drag knob	1
88	3513-209	Knob label	1
89	M806-025	Pin, coiled-spring, 2.5 mm dia. x 16 mm long, mdp	1
90	3388-232	Tilt drag drum	1
91	M005-813	Screw, grub, dog point, socket head, M4 x 10 mm long	1
92	3388-11	Tilt drag shoe assembly - front	1



3388IP03

Fig 6.3 Mk 7B Cam Head - Pan Assembly

**Fig 6.3 Mk 7B Cam Head - Pan Assembly**

Item	Part No.	Nomenclature	Qty
1	M005-912	Screw, countersunk head, socket, M4 x 10 mm long	6
2	3388-208	Cover	1
3	M009-906	Screw, countersunk head, socket, M10 x 40 mm long	1
4	3388-217	Clamp washer	1
5	3388-255	Pan drag drum	1
6	3388-216	Drag shaft - pan	1
7	3388-263	Shoe pivot pins	2
8	3388-17	Pan friction shoe assembly - rear	1
9	M600-006	Washer, plain, heavy, M5	6
10	<a href="#">3388-207*</a>	Gasket	1
11	3388-213	Pan drag housing	1
12	M007-707	Screw, cap head, socket, M6 x 30 mm long	4
13	<a href="#">Q500-049*</a>	'Omniseal', 40.0 mm shaft dia. x 3.1 mm nominal section	1
14	3388-218	Seal retainer	1
15	P200-218	Bearing, ball, radial, 30 mm ID x 62 mm OD x 16 mm long, two shields	1
16	3388-254	Bearing retainer	1
17	M004-905	Screw, countersunk head, socket, M3 x 20 mm long	6
18	3388-253	Brake disc (pan)	1
19	P602-008	Washer, thrust, bearing, 110 mm ID x 145 mm OD x 1 mm thick	2
20	P602-009	Bearing, needle roller, thrust, 110 mm ID x 145 mm OD x 4 mm long, with cage assembly	1
21	<a href="#">3388-229*</a>	Base ring, with:	1
NI	<a href="#">L850-053*</a>	Threaded-insert, wire thread insert (helicoil), 3/8 in. BSW x 1-1/2 Diameters long	4
22	L602-122	Washer, plain, small, heavy, 3/8 in.	4
23	L054-714	Bolt, hex head, 3/8 in. BSW x 1 in. long	4
24	3388-219	Pan bearing shaft	1
25	M801-036	Pin, dowel, 5 mm dia. x 16 mm long	2
26	M006-904	Screw, countersunk head, socket, M5 x 16 mm long	2
27	M801-004	Pin, dowel, 4 mm dia. x 12 mm long	2
28	M005-502	Screw, button head, socket, M4 x 10 mm long	8

**Fig 6.3 Mk 7B Cam Head - Pan Assembly**

Item	Part No.	Nomenclature	Qty
29	<a href="#">Q001-012*</a>	'O'-Ring, 5/16 in. nominal ID x 0.070 in. section, hardness 70 IRHD	2
30	3388-214	Pan drag actuator	1
31	3513-209	Knob label	1
32	3388-260	Pan drag knob	1
33	M500-087	Nut, M6, standard (hex), lock	1
34	3388-212	Guide bush	1
35	M701-052	'E'-Clip, standard, 10.50 mm shaft dia. x 1.00 mm thick	1
36	3388-233	Thrust washer	1
37	3388-16	Pan friction shoe assembly - front	1
38	M801-035	Pin, dowel, 2 mm dia. x 12 mm long	1
39	M801-009	Pin, dowel, 5 mm dia. x 25 mm long	3
40	<a href="#">Q001-006*</a>	'O'-Ring, 1/8 in. nominal ID x 0.070 in. section, hardness 70 IRHD	1
41	3388-262	Brake shaft	1

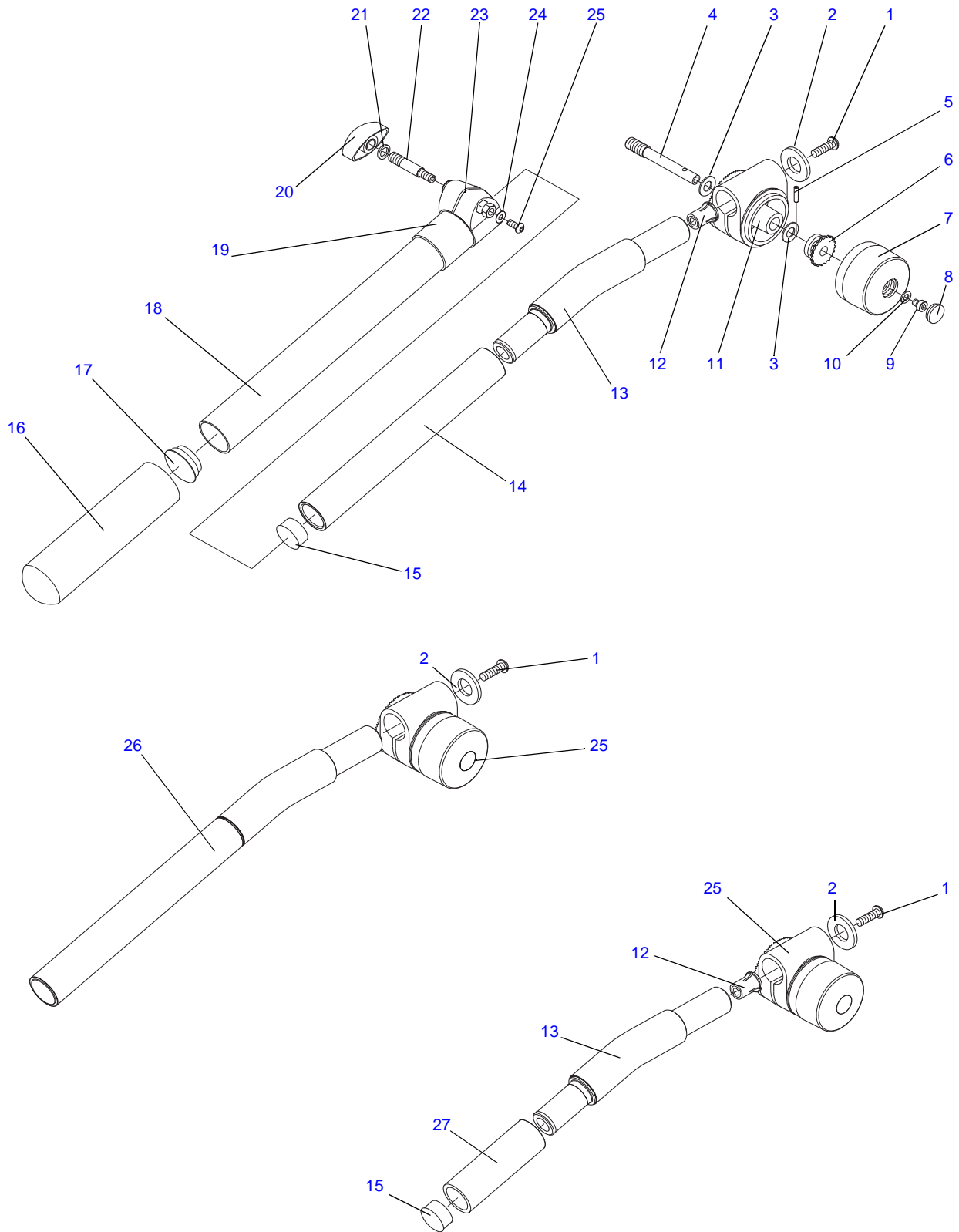


Fig 6.4 Mk 7B Cam Head - Pan Bars

**Fig 6.4 Mk 7B Cam Head - Pan Bars**

Item	Part No	Nomenclature	Qty
	3219-62	Pan bar and clamp assembly, comprising:	
1	M007-506	Screw, button head, socket, M6 x 20 mm long	1
2	3308-159	Washer	1
	3219-60	Pan bar clamp assembly (Vector 70), consisting of:	
3	M600-009	Washer, plain, heavy, M8	2
4	3219-283	Pan bar clamp shaft [was 3354-295]	1
5	L801-105	Pin, dowel, 1/8 in. dia. x 9/16 in. long	1
6	3354-293	Serrated boss	1
7	3354-290	Knob	1
8	3354-292	Knob bung	1
9	M006-737	Screw, low-profile, cap head, socket, M5 x 6 mm long	1
10	M600-006	Washer, plain, heavy, M5	1
11	3219-280	Pan bar clamp (Vector)	1
	3219-61	Pan bar assembly (Vector 70), consisting of:	
	3219-65	Fixed bar assembly (Vector 70), consisting of:	
12	M500-085	Threaded-insert, blind captive nut, M6	1
13	3219-290	Fixed tube spigot end for long bar	1
14	3219-291	Fixed tube control end long	1
15	J550-093	Plug, tube-end, to fit 1 in. tube OD	1
	3219-64	Sliding tube assembly (Vector 70), consisting of:	
16	3219-276	Pan bar grip (Mk 7B)	1
17	J550-104	Plug, tube-end, to fit 1-1/4 in. tube OD	1
18	3219-63	Sliding tube / clamp assembly (Vector 70)	1
19	3219-289	Shrink wrap sleeve (Vector 70)	1
20	K403-014	Knob, locking-key, female, M8 thread, 40 mm wide	1
21	3219-211	Washer	1
22	3219-288	Clamp shaft (telescopic pan bar) (Vector 70)	1
23	M500-082	Nut, M6, standard (hex), full	1
24	M600-304	Washer, plain, large, M4	1
25	M005-511	Screw, button head, socket, M4 x 8 mm long	1
	3219-67	Short pan bar and clamp assembly (Vector 70), comprising:	



**Fig 6.4 Mk 7B Cam Head - Pan Bars (Cont)**

Item	Part No	Nomenclature	Qty
1	M007-506	Screw, button head, socket, M6 x 20 mm long	1
2	3308-159	Washer	1
25	3219-60	Pan bar clamp assembly (Vector 70) - parts as above	1
26	3219-65	Fixed bar assembly (Vector 70) - parts as above	1
	3219-66	Fixed bar / clamp assembly (Vector 70), comprising:	
1	M007-506	Screw, button head, socket, M6 x 20 mm long	1
2	3308-159	Washer	1
	3219-68	Short pan bar assembly (Vector 70), consisting of:	
12	M500-085	Threaded-insert, blind captive nut, M6	1
13	3219-290	Fixed tube spigot end for long bar	1
15	J550-093	Plug, tube-end, to fit 1 in. tube OD	1
25	3219-60	Pan bar clamp assembly (Vector 70) - parts as above	1
27	3219-297	Short fixed tube	1



**Fig 6.5 Mk 7B Cam Head - Composite Spare Parts**

Part No.	Nomenclature	Qty
3388-900SP	Platform assembly (with helicoil), comprising:	
3388-203	Platform	1
M850-005	Threaded-insert, wire thread insert (helicoil), M6 x 1-1/2 Diameters long	1
3388-901SP	Base assembly (with helicoil), comprising:	
3388-229	Base ring	1
L850-053	Threaded-insert, wire thread insert (helicoil), 3/8 in. BSW x 1-1/2 Diameters long	4
3388-903SP	Seal kit, comprising:	
3388-207	Gasket	1
3388-234	Tilt housing gasket	1
Q001-006	'O'-Ring, 1/8 in. nominal ID x 0.070 in. section, hardness 70 IRHD	1
Q500-049	'Omniseal', 40.0 mm shaft dia. x 3.1 mm nominal section	1
Q500-050	'Omniseal', 20.0 mm shaft dia. x 2.3 mm nominal section	2
Q001-012	'O'-Ring, 5/16 in. nominal ID x 0.070 in. section, hardness 70 IRHD	4
R900H052	'O'-Ring, 12 mm ID x 3.00 mm section, hardness 70 IRHD	2