

The GNT 3406-M Tape Punch Station

manual



GNT AUTOMATIC

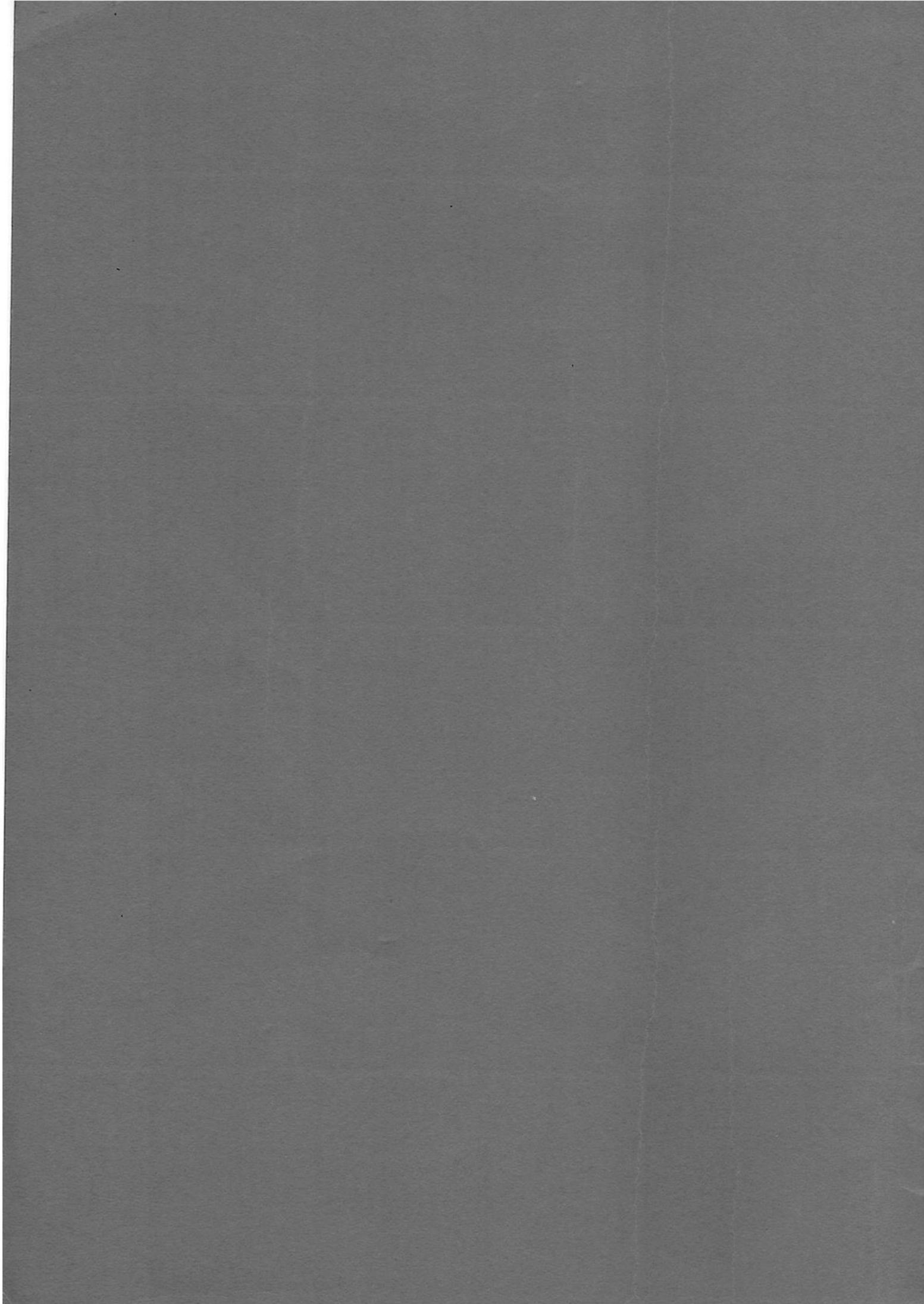


TABLE OF CONTENTS

Section	Title	Page
1.	INTRODUCTION	4
2.	SPECIFICATION	5
2.1	General	5
2.2	Environment	5
2.3	A . C. Supply	5
2.4	Tape	6
2.5	Performance	6
2.6	Input and Output signals	7
2.7	Accessories	7
3.	OPERATING INFORMATION	8
3.1	Unpacking	8
3.2	Installation	8
3.3	Controls	10
3.4	Preliminary Checks	13B
3.5	Tape Loading with Automatic Take-up	14
3.6	Removing the Punched tape	16
3.7	Tape Loading without Automatic Take-up	18
3.8	Chad Box	18
4.	APPLICATIONS	20
4.1	Parallel Operation	20
4.2	Serial Operation	22
5.	TECHNICAL DESCRIPTION	25
5.1	Mechanical design	25
5.2	Electrical design	36
6.	MAINTENANCE	49
6.1	Servicing	49
6.2	Adjustment	55
6.3	Dismantling	74
7.	FAULT FINDING INFORMATION	101
7.1	Diagnostic Chart	101
7.2	Wiring Diagram	105
8.	SPARE PARTS LIST	112
8.1	Essential Spares List	112
8.2	Recommended Spares List	112
8.3	Complete Spares List	114

KARNEBOGEN GMBH

Hagener Straße 3

D-5883 Kierspe 1-Vollme

Telefon (023 59) 23 98

Telex 826 227 karbo d

(West-Deutschland)

ILLUSTRATIONS

<u>Figure</u>		<u>Page</u>
Fig. 1.1	GNT 3406 Tape Punch Station	4
Fig. 2.1	Operating Voltage and Temperature	5
Fig. 3.1	Inserting Chad Box and Tape Guide Box	8
Fig. 3.2	Rack Mounting Kit and Punch Station	8, 9
Fig. 3.3	Front Panel	11
Fig. 3.4	Rear Panel	12
Fig. 3.5	Signal Connector Seen From Rear	13
Fig. 3.5a	Jumper and Switch Table	13A
Fig. 3.5b	PCB Layout	13B
Fig. 3.6	Removing Upper Disc	14
Fig. 3.7	Inserting Roll of Tape	15
Fig. 3.8	Loading Punch Unit	15
Fig. 3.9	Returning Tape Load Arm	15
Fig. 3.10	Inserting Upper Disc Assembly	15
Fig. 3.11	Cutting the Tape	17
Fig. 3.12	Removing Tape Guide Box	17
Fig. 3.13	Leading Tape out through Front Cover	19
Fig. 3.14	Removing Chad Box	19
Fig. 4.1	Timing Diagram, Parallel Operation	21
Fig. 4.2	Timing Diagram, Serial Operation	23
Fig. 5.1	Punch Timing Diagram	24
Fig. 5.2	Tape Handler System	27
Fig. 5.3	Centrifugal Clutch	29
Fig. 5.4	Electro-magnetic Control Clutch	31
Fig. 5.5	Punching Mechanism	33
Fig. 5.6	Tape Latch	34
Fig. 5.7	Timing Contacts	35
Fig. 5.8	A. C. Power Circuit	36
Fig. 5.9	Low Voltage Power Circuit	37
Fig. 5.10	Interface Circuit Diagram	39
Fig. 6.1	Lubrication, A	51
Fig. 6.2	Lubrication, B	52
Fig. 6.3	Lubrication, C	52
Fig. 6.4	Lubrication, D	53
Fig. 6.5	Lubrication, E	53
Fig. 6.6	Lubrication, F	54
Fig. 6.7	Lubrication, G	54
Fig. 6.8	Tape Guide Box	55
Fig. 6.7	Clutch Magnet Positioning	56
Fig. 6.10	Clutch Magnet Adjusting Screw Locations	57
Fig. 6.11	Clutch Magnet Adjustment	57
Fig. 6.12	Clutch Stop Position Adjustment	58
Fig. 6.13	Tape Pitch Adjustment	59

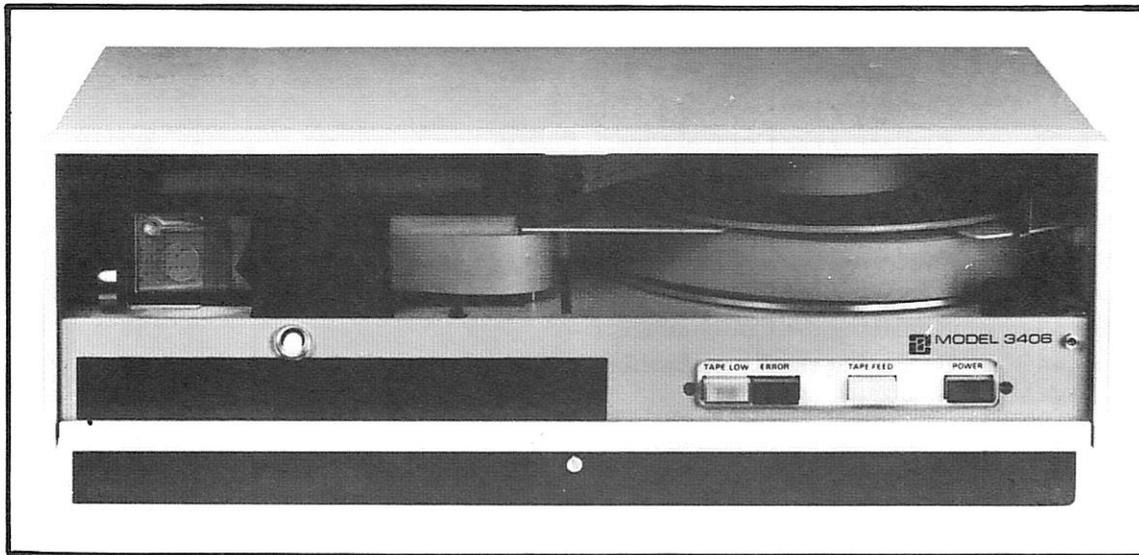
Fig. 6.14	U-Bracket Adjustment	61
Fig. 6.15	U-Bracket Adjustment Diagram	61
Fig. 6.16	Punch Bridge Height Adjustment	62
Fig. 6.17	Selector Box Positioning	63
Fig. 6.18	Timing Cam Adjustment	64, 65
Fig. 6.19	Adjusting Forward Position of Tension Arm	66
Fig. 6.20	Brake Operating Point	67
Fig. 6.21	Chassis seen from Below	67
Fig. 6.22	Tape-Out Indication Point	67
Fig. 6.23	Taut-Tape Indication Point	67
Fig. 6.24	Adjusting Chad Sweeper Function	68
Fig. 6.25	Correct Tape Tracking	69
Fig. 6.26	Adjusting Tape Tracking	69
Fig. 6.27	Interconnection Arm Action Adjustment	70
Fig. 6.28	Track-duct Displacement	71, 72
Fig. 6.29	Track-duct Adjustment	73
Fig. 6.30	Removing Top Cover	75
Fig. 6.31	Fitting Intermediate Plate	76
Fig. 6.32	Removing Punch Unit	77
Fig. 6.33	Removing Motor from Punch Unit	78
Fig. 6.34	Loosening Visor Screws	79
Fig. 6.35	Releasing Locking Rod	79
Fig. 6.36	Replacing the Flat Drive Belt	80
Fig. 6.37	Replacing the Centrifugal Clutch	81
Fig. 6.38	Replacing the Control Clutch Pulley	82
Fig. 6.39	Replacing the Three-pronged Driven Part	83
Fig. 6.40	Removing the Selector Box	84
Fig. 6.41	Replacing the Timing Contacts	85
Fig. 6.42	Replacing the Main Shaft	86
Fig. 6.43	Replacing the Clutch Magnet	87
Fig. 6.44	Removing the Reset Bushing	88
Fig. 6.45	Removing the U-Bracket	89
Fig. 6.46	Replacing the Transport Head	91
Fig. 6.47	Replacing the Punch Set	92
Fig. 6.48	Replacing the Clutch Release Mechanism (Bracket)	93
Fig. 6.49	Removing the Clutch Lever Spring	94
Fig. 6.50	Removing the Clutch Lever	95
Fig. 6.51	Replacing the Brake Rings	96
Fig. 6.52	Separating Chassis from Base	97
Fig. 6.53	Removing Control Panel Unit	99
Fig. 7.1	Signal Waveforms	106, 107
Fig. 7.2	Pick-off Points on P. C. B.	108
Fig. 7.3	Wiring Diagram, Punch to P. C. B. Connections	109
Fig. 7.4	Auto Start/Stop P. C. B. to Logic P. C. B. Connections	110
Fig. 7.5	Auto Start/Stop Component Layout	111
Fig. 8.1	General Exploded View	115, 117
Fig. 8.2	Intermediate Plate, Exploded	119
Fig. 8.3	Chassis, Exploded	121
Fig. 8.4	Base, Exploded	123
Fig. 8.5	GNT 34 Punch, Exploded	125, 127, 129, 131, 133

SECTION 1
INTRODUCTION

The GNT 3406 Tape Punch Station is a self-contained unit designed for 5 and 8-channel ISO or 6-channel TTS data registration on standard 1", 11/16" and 7/8" tape.

The punch station features a complete tape handler with automatic threading and take-up. It also incorporates a parallel/serial microprocessor interface and the well-known and reliable GNT 34 tape punch. The interface includes automatic start/stop, parity check and generation, tape error and tape low indication, and selectable signal rate and format. The punch can be quickly and easily removed for servicing.

The GNT 3406 is a free-standing unit which can be easily mounted in a 19" rack with no alterations to the punch station itself.



SECTION 2
SPECIFICATION

2.1 GENERAL

Dimensions: Height: 165 mm (178 mm for rack mounting)
 Width: 443 mm
 Depth: 230 mm
 Weight: 10 kg

Colour: Blue/black/grey

Mounting: As free standing unit or in a standard 19" rack, with rack mounting kit.

2.2 ENVIRONMENT

Ambient temperature: Operating: + 8°C* to + 40°C
 Storage: - 20°C to + 70°C

Humidity: Max. 85% RH without condensation.

The 3406 is designed to be used in a normal office or computer type environment.

2.3 A. C. SUPPLY (To be stated when ordering).

Voltage ($\pm 10\%$)*	V	100	100	115	220	240
Frequency	Hz	50	60	60	50	50
Current	A	1.2	1.2	1.1	0.5	0.5

An a. c. power plug (to CEE P82-IV standard) and cable are supplied.

* The lower limits for operating temperature and a. c. supply voltage must not occur simultaneously, see Fig. 2.1.

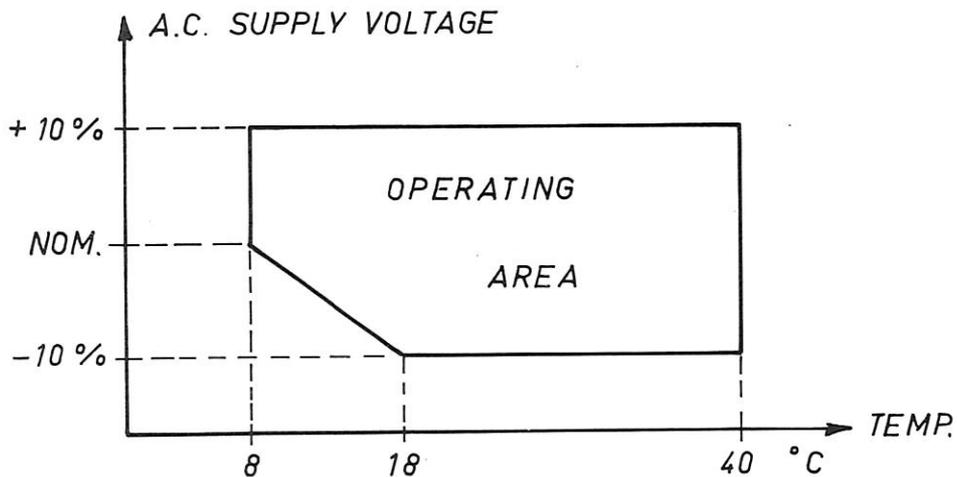


Fig. 2.1 Operating Voltage and Temperature

2.4 TAPE

Material: Paper, oiled or non-oiled (according to ISO 1729) or paper/mylar/paper.

Form: Rolls, max. diameter 8" (203 mm), with standard 2" core.

Width: 8 unit (25.4 mm) or 6 unit TTS (22.2 mm).

2.5 PERFORMANCE

Speed

70 CHAR./S VERSION

Parallel Operation:
0 - 70 char./s (approx.) PUNCH controlled by READY
0 - 40 char./s Open-loop

Serial Operation:
100, 150, 300, 600 Baud RD controlled by DTR
110, 150, 300 Baud Open-loop

40 CHAR./S VERSION

Parallel Operation:
0 - 40 char./s (approx.) PUNCH controlled by READY
0 - 25 char./s Open-loop

Serial Operation:
100, 150, 300, 600 Baud RD controlled by DTR
100, 150 Baud Open-loop

Punching Tolerances:

According to ISO R-1154.

Automatic Start/Stop

Data is accepted immediately. After 1 s, the motor is up to speed and punching can begin. The motor stops again 10 s after the last character has been punched.

Remote Control

DC2: on-line (data punched)
DC4: off-line (data not punched)

DC2/DC4 enabled by means of jumper no. 7. See page 13A.
If disabled, the punch station is "on-line".

2.6 INPUT AND OUTPUT SIGNALS

Input Signals (Parallel)

DA1 - DA8, $\overline{\text{EVPA}}$, $\overline{\text{ODPA}}$

Logical 1 2.0 to 6 V or open
Input current at 2.7 V, max. 20 μA

Logical 0 - 0.5 to 0.8 V
Load at 0.4 V, max. 0.2 mA

PUNCH

Logical 1 2.0 to 6 V
Input current at 2.7 V, max. 20 μA

Logical 0 - 0.5 to 0.5 V
Load at 0.4 V, max. 0.4 mA

Output Signals (Parallel)

READY, TAPE LOW, TAPE ERROR, PAER

Logical 1 2.7 to 5 V
Output voltage at - 0.4 mA, min. 2.7 V

Logical 0 0 to 0.4 V
Output voltage at 4 mA, max. 0.4 V

Input Signals (Serial)

RD*

Logical 1 (Neg.) - 25 to + 0.75 V
Logical 0 (Pos.) 2.25 to 25 V

Rx +, Rx - (Current-loop)

Logical 1 12 to 100 mA } Max. input voltage,
Logical 0 - 100 to 3 mA } 3.5 V at 20 mA

Output Signals (Serial)

DTR*, SRTS*

Logical 1 (Neg.) - 12 to - 5 V
Logical 0 (Pos.) 5 to 12 V

* The electrical load and generator parameters are in accordance with CCITT recommendation V24.

2.7 ACCESSORIES

An a. c. power cable with CEE type plug and 3 standard tape cores (8 hole or TTS) are supplied. Also available is a rack mounting kit, No. KDYK 14901.

SECTION 3

OPERATING INFORMATION

3.1 UNPACKING

Inspect the shipping container for damage incurred during transit. Unpack the container removing all packing material from inside the punch station. Check the serial number and version of the punch station (there is a label on the rear panel). Save all packing material for future use.

The chad box, tape guide box, top flange and 3 cores will be found in one half of the container, external to the punch station. The a. c. power cable is packed in the tape guide box cavity and should be removed. Fit a suitable a. c. power plug to the cable, and plug the other end into the receptacle on the rear panel of the punch station.

The upper disc is packed directly on top of the lower disc, with a TTS tape core acting as packing, and should be removed. Slide the chad box and tape guide box into position, see Fig. 3.1. Place a correct sized core on the upper disc (do not use the TTS packing core on an 8-hole punch station). Hold the release arm to the right, and put the upper disc assembly into place in the cabinet as shown in Fig. 3.10. Perform a visual inspection of the punch station.

3.2 INSTALLATION

The GNT 3406 Tape Punch Station can be used as a free standing table top unit. Alternatively it can be mounted in a standard 19" rack, using the Rack Mounting Kit. This kit consists of two angle brackets, a threaded rod, 4 M3 nuts, and a 1 unit high front panel (see Fig. 3.2). In the rack mounting version the GNT 3406 occupies, together with the 1 unit high front panel, a total of 4 units of height. Rack-mounting of the punch station is carried out as follows:



First mount the two angle brackets on the rack frame at the desired height. Insert the rod through the mounting holes in the brackets with a nut on either side of each angle bracket. Tighten the nuts in such a way that each bracket is at right angles to the front of the rack. The punch station can then be mounted in the rack between the two angle brackets. The final operation is to mask off the base of the punch station by means of the 1 unit high front panel. This panel also ensures that the punch station is not inadvertently pulled out of the rack.

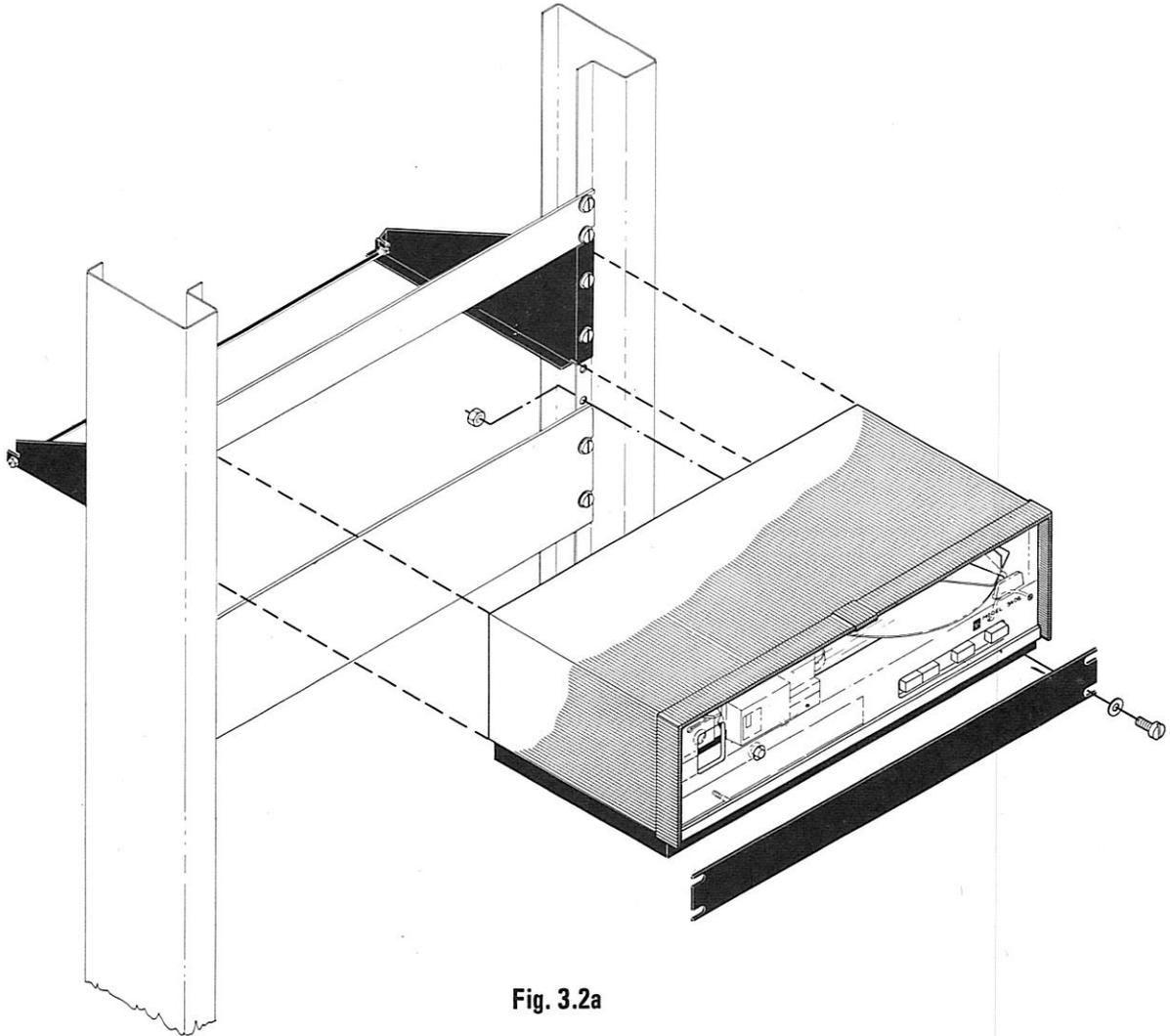


Fig. 3.2a

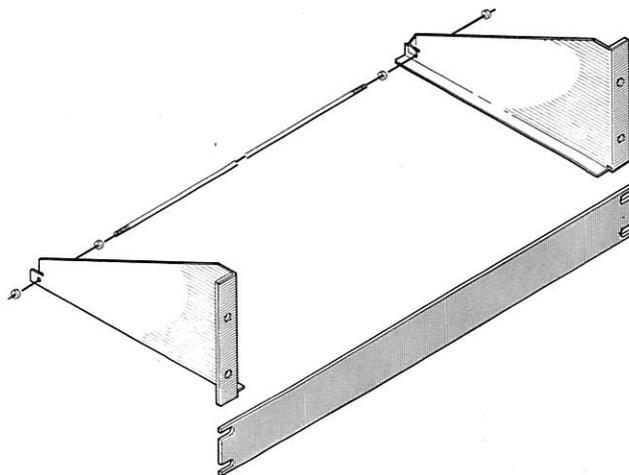


Fig. 3.2b

3.3 CONTROLS

3.3.1 Front Panel

See Fig. 3.3

POWER ON

This illuminated push-button is used to switch the punch station on and off. When the a. c. supply is connected and switched on, the green indicator lamp, which is connected to the + 5 V supply, will light. The POWER ON button switches the a. c. supply to both the transformer and the start/stop relay (see Fig. 5.8). The punch motor is disabled until the first character is sent.

Power should not be switched off and then immediately on again, as this will defeat the microprocessor's reset function

SERIAL INPUT

When this push-button is depressed, the punch station is set to accept serial data. When the button is released, the punch station is set to accept parallel data.

TAPE FEED/ TAPE LOW

Pressing the TAPE FEED push-button causes tape to be punched with feed holes only. Tape feed continues as long as the button is held. If there are any characters in the buffer, these will be punched before tape feed is initiated. If the motor is stopped when TAPE FEED is pressed, there will be a 1 second delay while the motor comes up to speed. If the button is released before the 1 second has elapsed, only 1 feed hole will be punched. Note that tape feed is never locked, and empties the buffer even if ERROR is active.

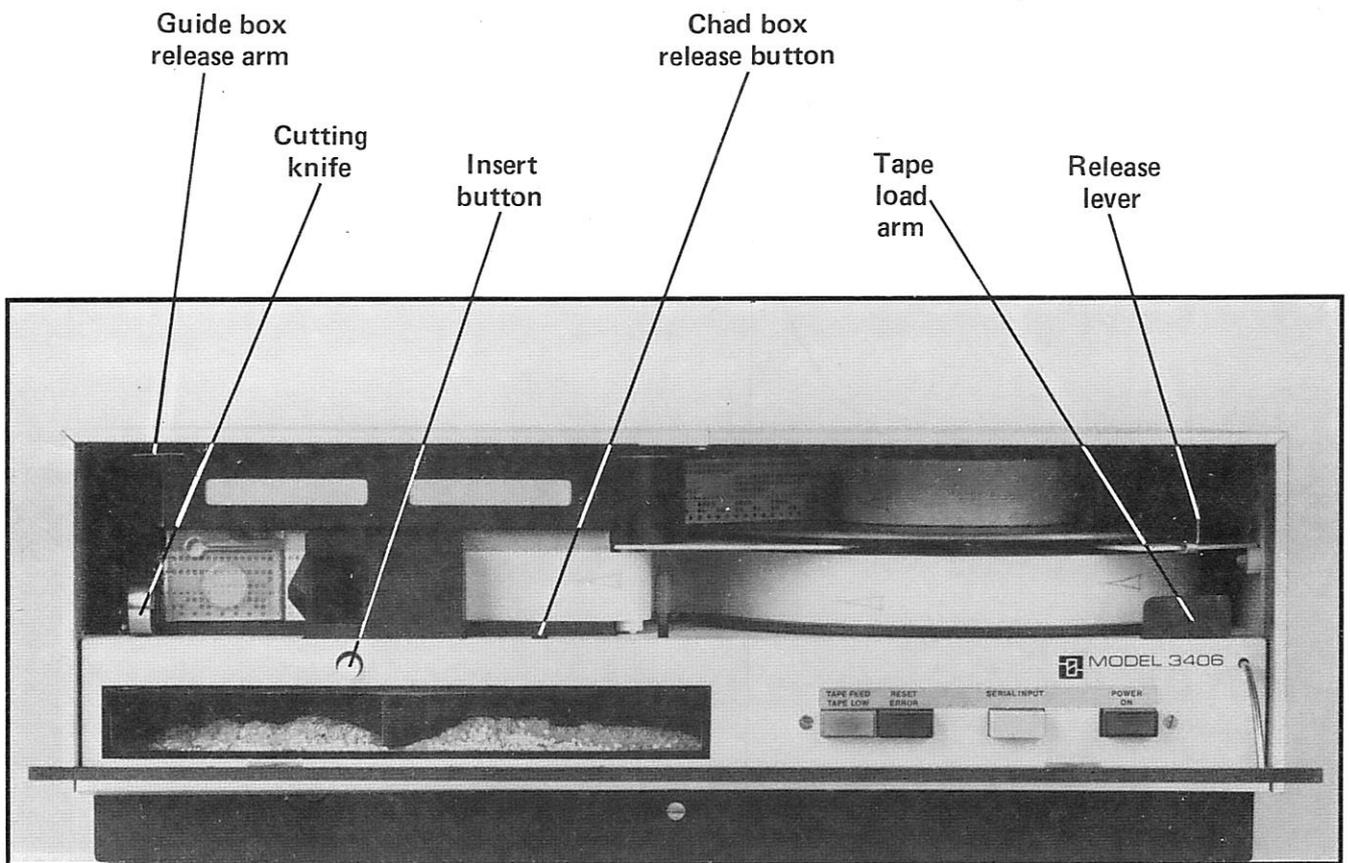
The yellow TAPE LOW lamp flashes when the roll of tape is almost exhausted, thus indicating that a fresh roll should be loaded. When the TAPE LOW indicator is on, a logical "1" output signal is provided on pin 21 of the parallel signal connector. This signal can be used to temporarily disable the data source. TAPE LOW does not prevent further punching.

RESET/ERROR

When RESET is depressed, the buffer is emptied, and the motor is switched off. RESET must be activated before punching can be resumed after ERROR.

When the red ERROR lamp lights, punching is stopped. For parallel operation, this indicates taut tape or tape out. For serial operation, there are the additional possibilities of framing, parity and overrun errors.

- RELEASE LEVER** This lever is used to release the upper disc.
- INSERT BUTTON** This white push-button is used to mechanically release the tape transport mechanism when loading the punch unit.
- GUIDE BOX RELEASE ARM** This arm is used to release the tape guide box.
- TAPE LOAD ARM** This arm is used to position the tension arm, when loading the punch station.
- CHAD BOX RELEASE BUTTON** This black push-button unlocks the chad box, enabling it to be emptied.
- CUTTING KNIFE** This built-in knife is used to cut the tape when unloading punched tape.



3.3.2 Rear Panel

See Fig. 3.4.

A. C. POWER RECEPTACLE

This input socket will accept a standard business machine power cable plug for connecting the GNT 3406 to the a. c. supply. The earth pin of the socket allows the chassis of the GNT 3406 to be earthed.

Power requirements: 100, 220, 240 V, 50 Hz, and 110, 115 V, 60 Hz.
Voltage and frequency must be specified at time of ordering.

FUSES

A. C. power fuses, slow blow type.

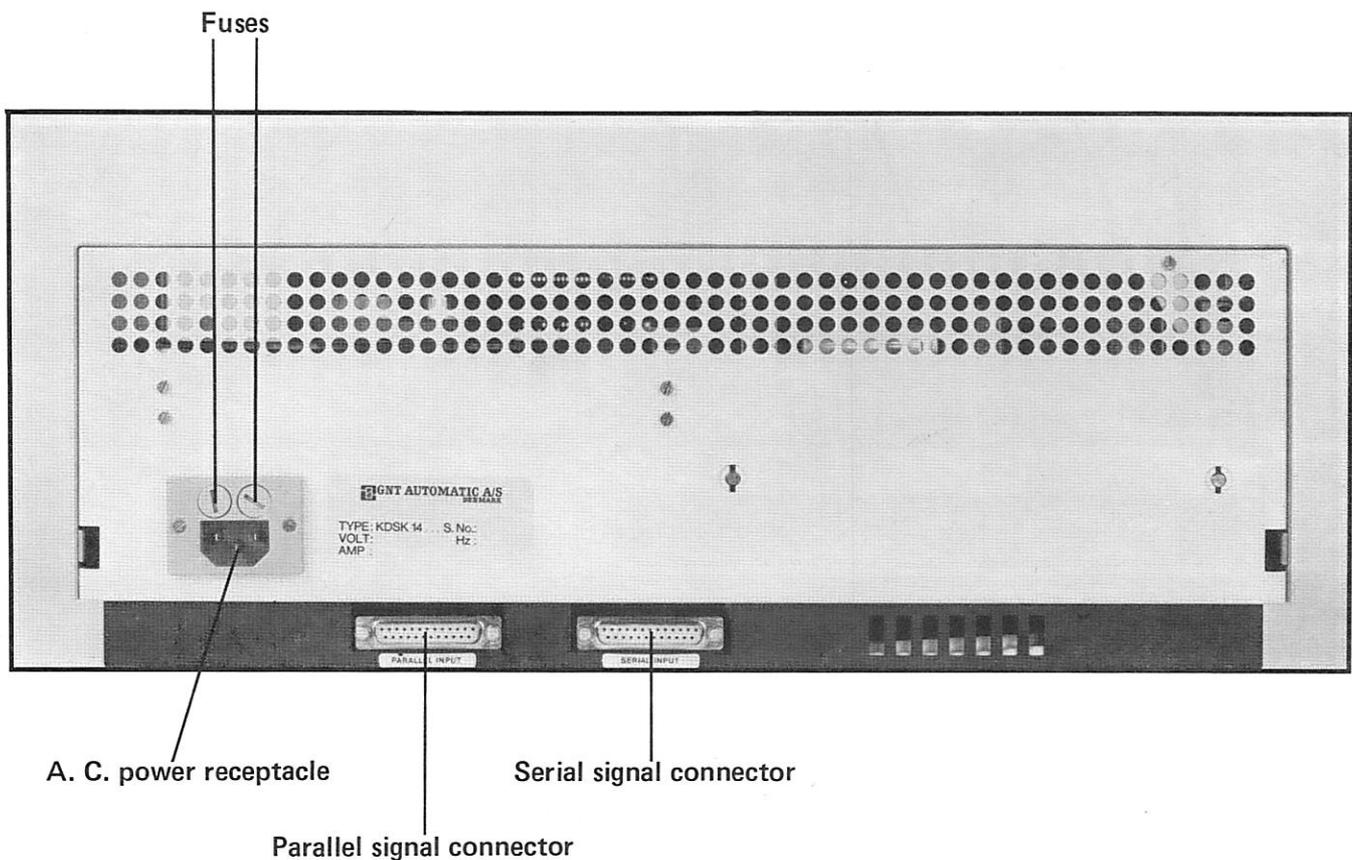
Ratings:

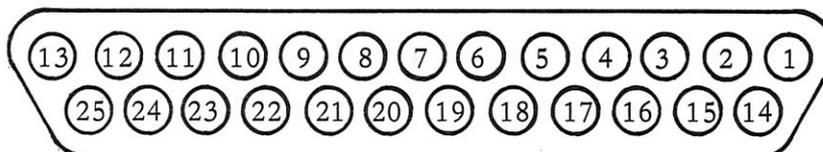
220 or 240 V supply: 0.5 A.

100, or 115 V supply: 1.25 A.

SIGNAL CONNECTORS

The signal connectors are of type Cannon DBP-25S. Pin connections are shown in Fig. 3.5.





Signal Connector, Cannon-ITT DBP-25S, as seen from rear.

Parallel Connector Plug 7			Serial Connector Plug 6		
Pin No.	Signal	Function	Pin No.	Signal	Function
1	DA1	Data input 1	1	PG	Protective Ground
2	DA2	Data input 2	2		
3	DA3	Data input 3	3	RD	Received Data
4	DA4	Data input 4	4		
5	DA5	Data input 5	5		
6	DA6	Data input 6	6		
7	DA7	Data input 7	7	SG (GND)	Signal Ground
8	DA8	Data input 8	8		
9			9		
10			10		
11	PUNCH	Punch command	11		
12	READY		12		
13			13	Rx -	Current loop return
14			14	RD*	
15			15	DTR*	
16	$\overline{\text{ODPA}}^*$	Check odd parity	16	Rx + *	Current loop, 20 - 100 mA
17	$\overline{\text{EVPA}}^*$	Check even parity	17		
18	PAER	Parity error	18	Rx + *	Current loop, 20 - 100 mA
19			19	SRTS	Secondary Request to send
20	TAPE ERROR		20	DTR	Data Terminal Ready
21	TAPE LOW		21		
22			22		
23			23		
24	+ 5 V	DC output, 5 V, 1 A	24		
25	GND	Signal Ground	25	SG (GND)*	

*Can also generate parity.

*Strapping alternative.

Fig. 3.5 Signal Connectors

3.3.3 INTERFACE PCB (See Figs. 3.5a and 3.5b)

The interface can be strapped and switched to match a wide variety of data sources. Fig. 3.5a summarizes the various possibilities, while Fig. 3.5b shows the locations of the jumpers and the DIP switch.

Jumper	Connected	Disconnected	Note
<u>V24</u>			
J1	2 - 3	2 - 4	Standard Strapping
J2		5 - 6, 5 - 7	
J3		9 - 10	
J4	11 - 12	11 - 13	
J5	15 - 18	15 - 17	
J6	21 - 22		PG connected to SG (GND)
<u>Current loop</u>			
J1		2 - 3, 2 - 4	
J2	5 - 7	5 - 6	Rx +, 20 mA
J2	5 - 6	5 - 7	Rx +, 60 mA
J3	9 - 10		
<u>Serial input, general</u>			
J7	23 - 24		DC2/DC4 disabled
J7		23 - 24	DC2/DC4 enabled
<u>Parallel input</u>			
J8	25 - 26		Generate parity (8-channel only)
J8		25 - 26	Examine parity

		<u>Switch No.</u>	
		1	2
Word Length:	5 bits	1	1
	6 bits	1	0
	7 bits	0	1
	8 bits	0	0

		<u>Switch No.</u>	
		3	4
Baud Rate:	110 Baud	1	1
	150 Baud	1	0
	300 Baud*	0	1
	600 Baud**	0	0

N. B. 0 = off, 1 = on,
x = irrelevant

		<u>Switch No.</u>	
		5	6
Stop Bits:	1 bit	1	1
	1.5 bits	0	1
	2 bits	x	0

		<u>Switch No.</u>	
		7	8
Parity Check:	disabled	x	1
	even	1	0
	odd	0	0

*On 40 char./s versions, use of DTR is necessary.

**On all versions, use of DTR is necessary.

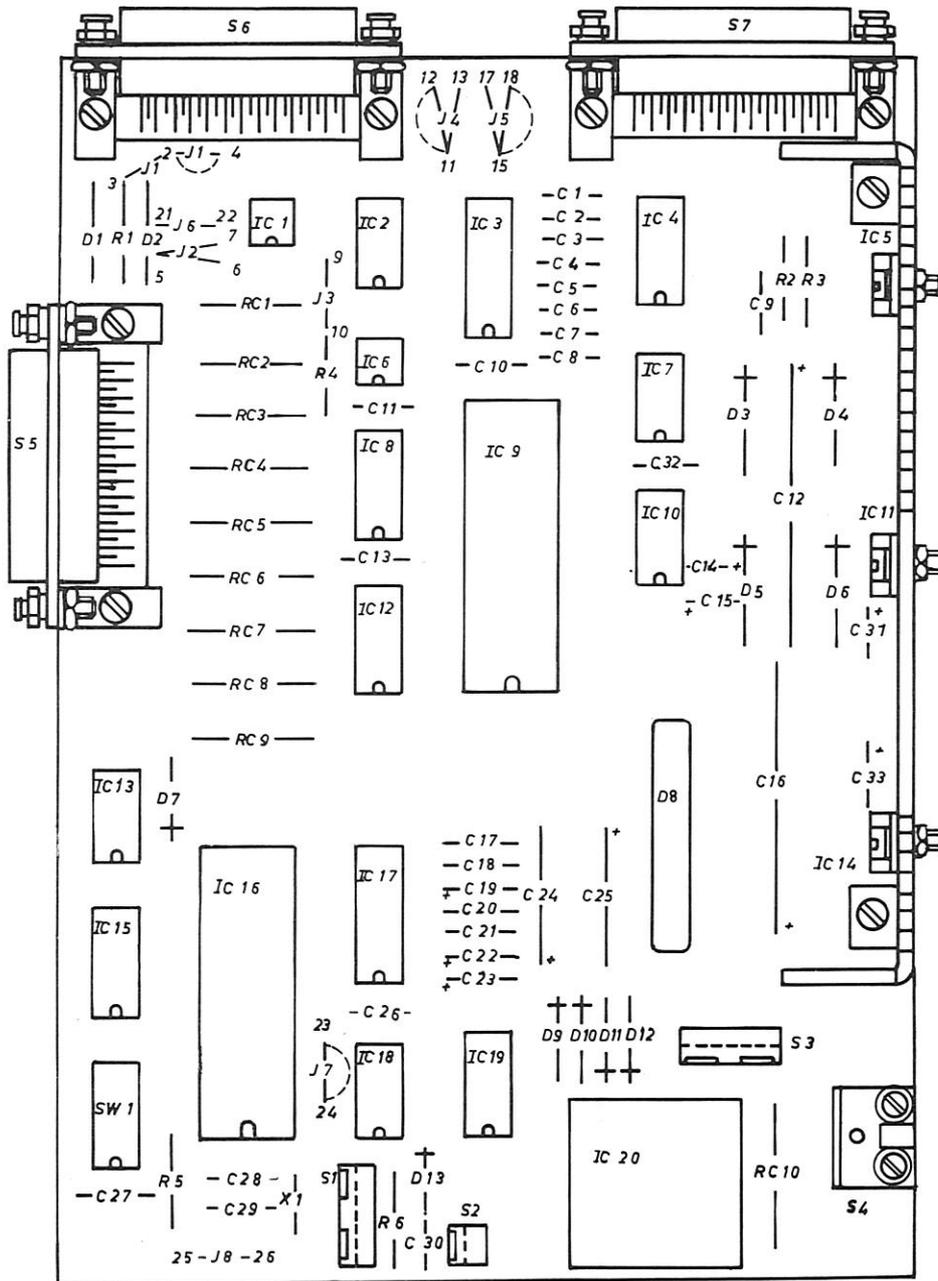


Fig. 3.5b P. C. B. Layout

3.4 PRELIMINARY CHECKS

Connect the punch station to the a. c. supply, and press the POWER ON push-button. The green indicator lamp should then light up.

Press the TAPE FEED button momentarily, and check (audibly) that the punch unit starts running. The upper disc should begin to rotate. After 10 seconds, the punch motor should stop again.

Switch off the power by pressing the POWER ON button, and connect the GNT 3406 to a compatible data source by means of a cable plugged into the proper 25-pin signal connector on the rear panel. Check that the SERIAL INPUT button is in the relevant position.

3.5 TAPE LOADING WITH AUTOMATIC TAKE-UP

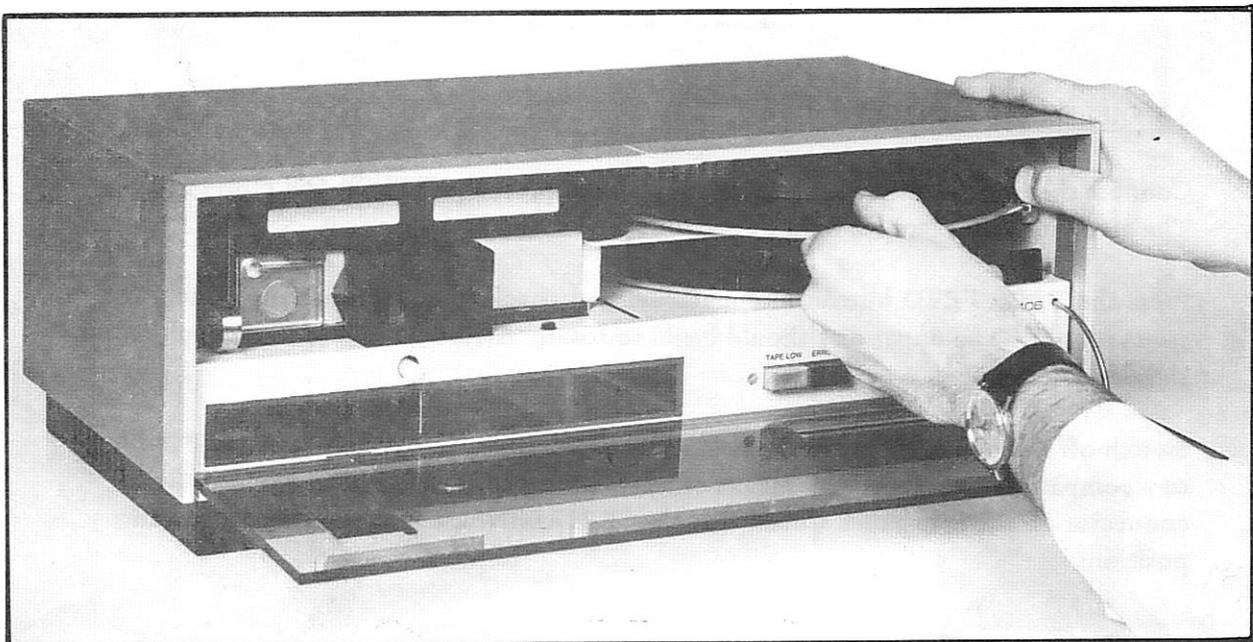
1. Open the transparent front cover, which is hinged along its lower edge.
2. Release the upper disc (the take-up spool), by means of the release lever situated at the right-hand top corner, and pull out the upper disc, see Fig. 3.6.
3. Turn the tape load arm to the right so that the tension arm emerges from the inside of the cabinet.
4. Lift the intermediate plate, remove the empty core, if any, and slide a roll of tape on to the lower disc in such a way that the free end of the tape, when turned towards the front cover, points to the left, see Fig. 3.7. Make sure that the core fits properly on the lower disc hub.

NB: It is essential that the roll of tape has flat sides. This can be achieved by pressing it against a flat surface.

When the roll of tape is a new one, the outer couple of turns should be torn off and discarded.

5. Release the transport mechanism by holding the insert button in, and pass the tape behind the tension arm roller through the punch unit head, see Fig. 3.8. Release the INSERT button.
6. Turn the tape load arm back again, see Fig. 3.9. The tension arm roller then pulls the tape towards the inside of the cabinet.
7. Ensure that there is an empty core on the upper disc, with the top flange on top of the core. Hold the release lever over to the right and put the upper disc assembly back into place in the cabinet as shown in Fig. 3.10.
8. Press POWER push-button and then the TAPE FEED push-button, and check that the tape moves through the punch unit and winds up on the upper disc. Now release the TAPE FEED push-button.

The GNT 3406 Tape Punch Station is now loaded and ready to operate.



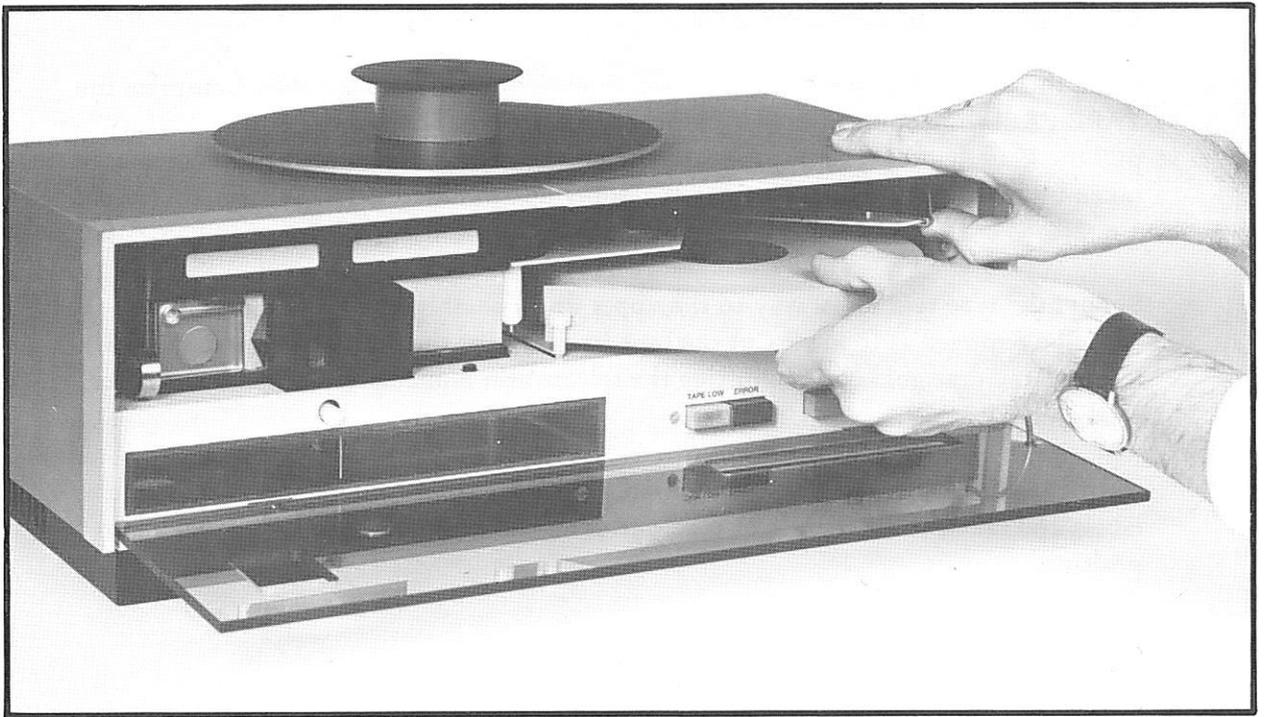


Fig. 3.7 Inserting Roll of Tape



Fig. 3.8 Loading Punch Unit



Fig. 3.9 Returning Tape Load Arm

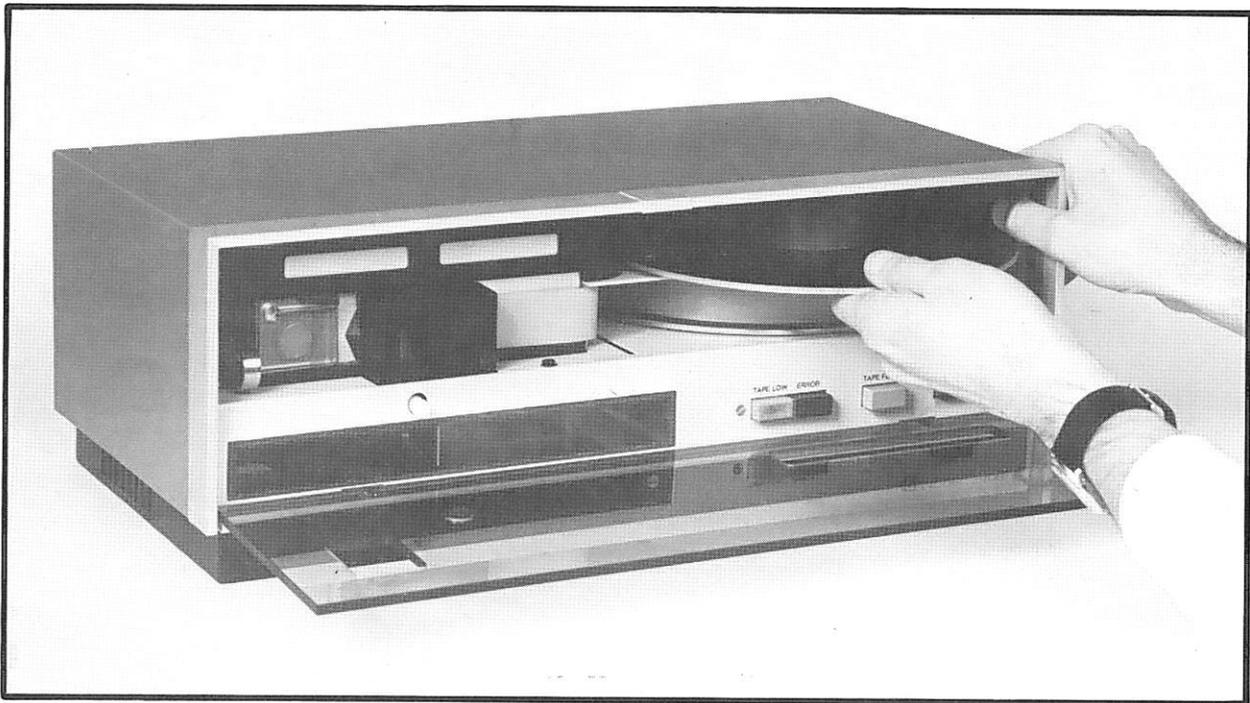


Fig. 3.10 Inserting Upper Disc Assembly

3.6 REMOVING THE PUNCHED TAPE

When the punched tape is to be removed from the upper disc assembly, first press the TAPE FEED button until the last punched character has passed the cutting knife. Then pull the knife handle, and cut the tape. After being cut, the tape will automatically be taken-up by the upper disc. Remove the upper disc as described in Section 3.5 (points 1 & 2).

Should the tape tear on its way to the upper disc assembly, the loose piece of tape can easily be removed as follows: Cut the tape by means of the built-in knife, see Fig. 3.11. Remove the tape guide box by lifting the release arm immediately beneath the cover, see Fig. 3.12.

Having removed the tape guide box, open it by means of a coin (as shown on guide box label), and take the loose piece of tape out. Shut the guide box and slide it back into position.

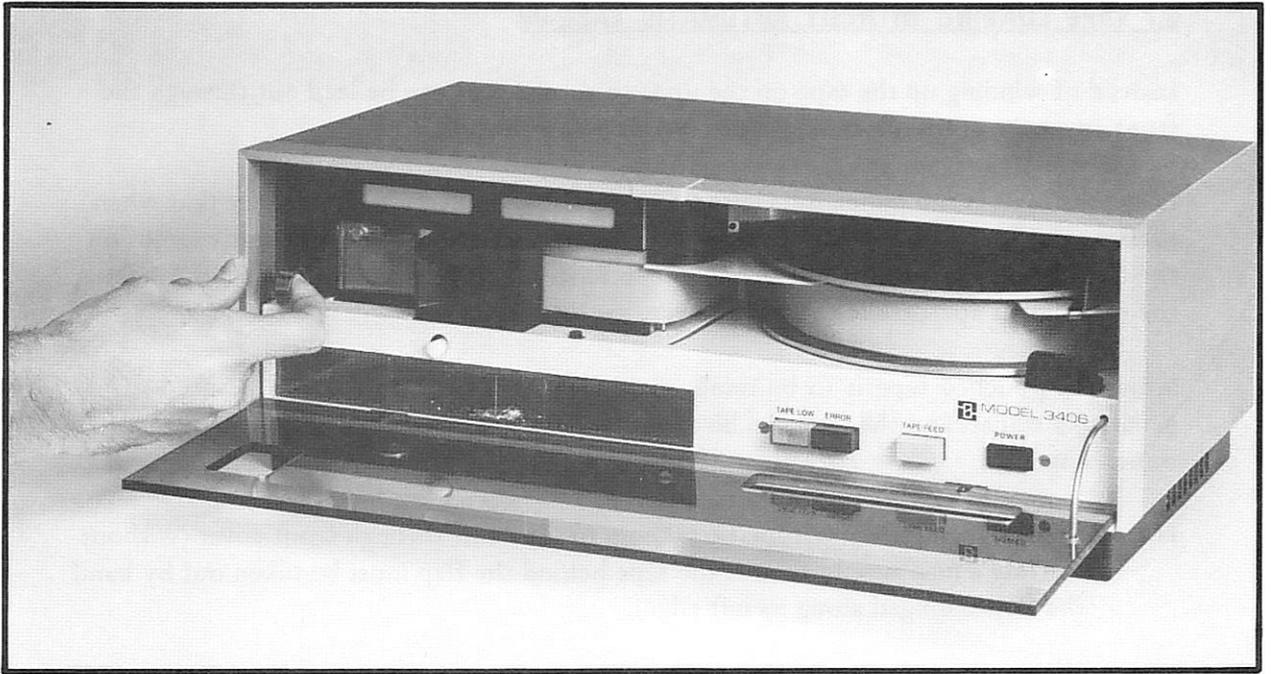


Fig. 3.11 Cutting the Tape

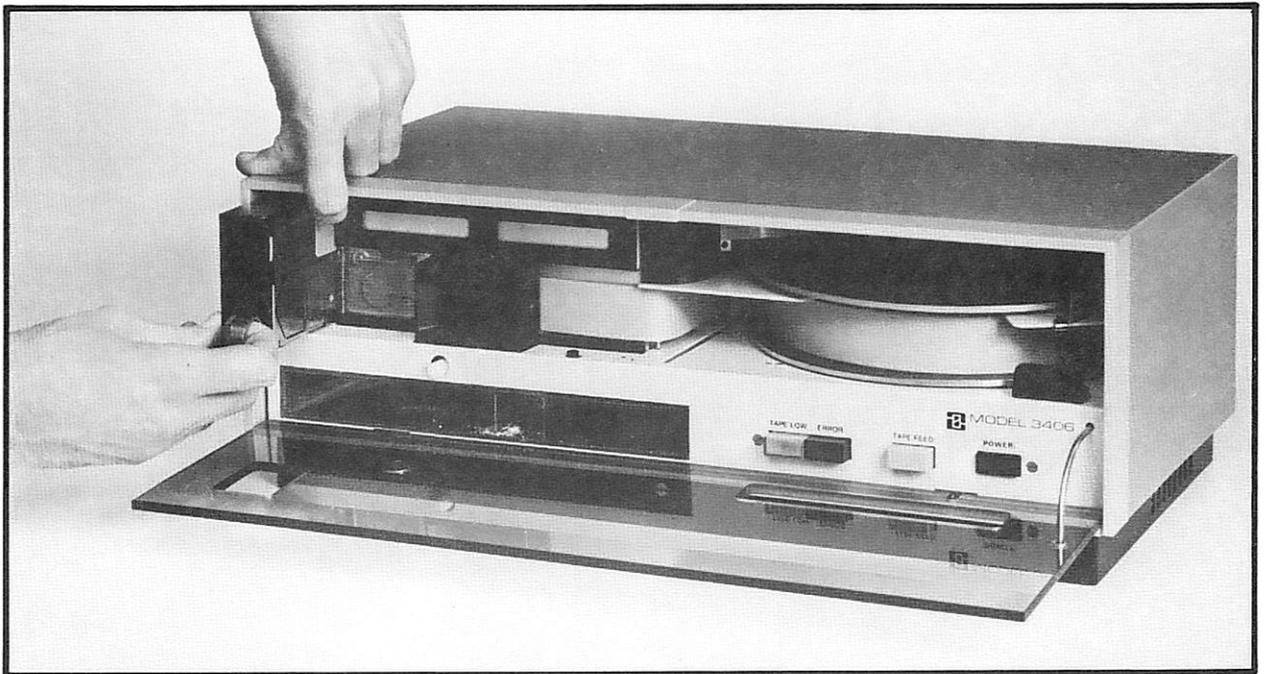


Fig. 3.12 Removing Tape Guide Box

3.7 TAPE LOADING WITHOUT AUTOMATIC TAKE-UP

Instead of winding up the tape on the upper disc, the tape can be lead out through the front cover, (e. g. if a short length of tape is to be punched).

Insert the tape in the punch unit in the way described in Section 3.5, except that when pressing the TAPE FEED push-button, press at the same time (using the left thumb) on the flap situated just to the left of the punch unit. The tape will then emerge through the rectangular aperture in the front cover, see Fig. 3.13.

When the punched tape is to be removed, the TAPE FEED button can be used to generate a trailer, and the tape can be torn off against the V-shaped tear edge of the punch unit.

N.B. When changing from automatic take-up to tape exit through front cover (without inserting a new supply spool), the tape behind the flap must be taken out by hand (the flap is hinged along its left edge).

3.8 CHAD BOX

The chad box can be removed for emptying by pressing the black chad box release push-button, see Fig. 3.14.

Because of its small height, the chad box is fitted with a sweeper. During punching, the sweeper pushes the chads away from under the chad channel.

If the chad box becomes full, punching stops automatically, and the same warning and output signals are given as for taut tape.

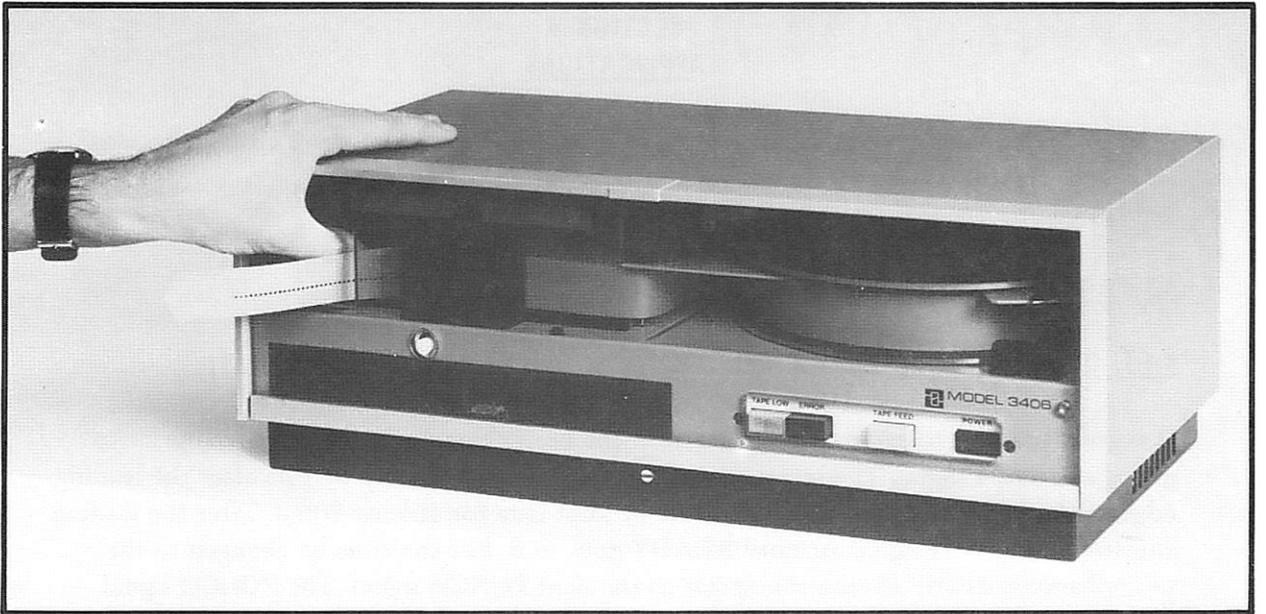


Fig. 3.13 Leading Tape out through Front Cover

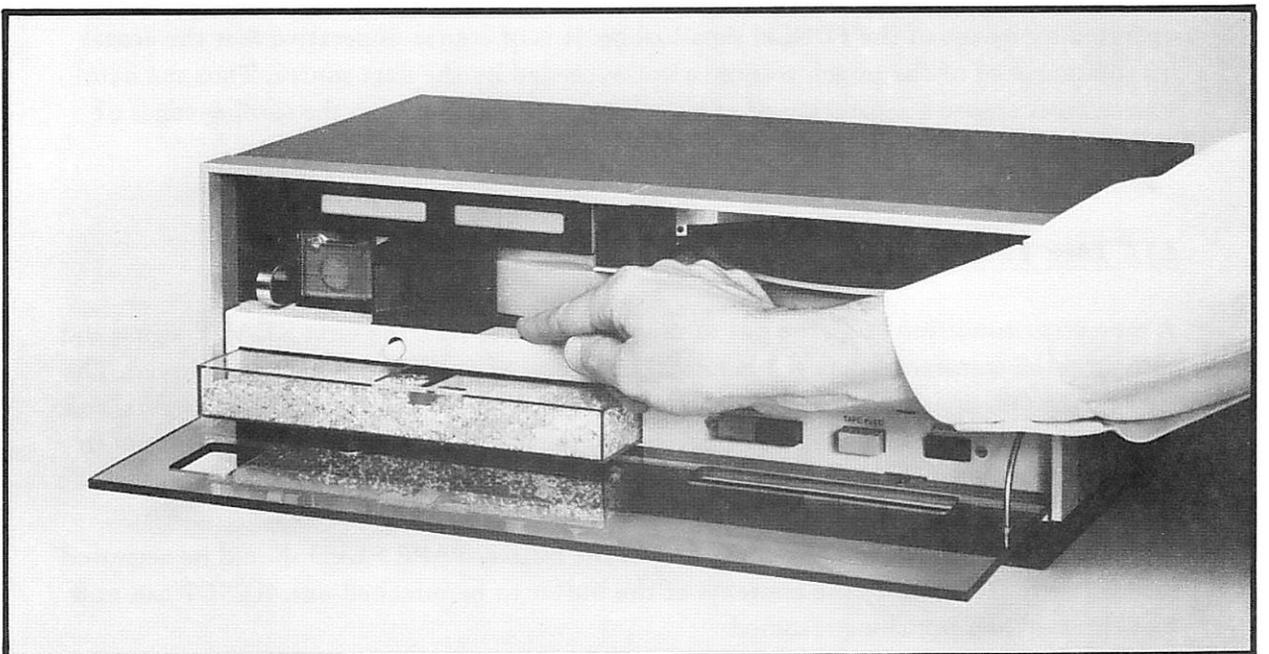


Fig. 3.14 Removing Chad Box

SECTION 4

APPLICATIONS

N. B.: Where different speeds and times apply for the 70 char./s and 40 char./s versions, the figures for the 40 char./s version are given in parenthesis.

4.1 PARALLEL OPERATION

4.1.1. DATA and PUNCH (See Fig. 4.1)

It is good practice to provide new data (i. e. the next character to be punched) prior to giving a PUNCH signal. The interface will however accept data up to 1 μ s after the leading edge of the PUNCH signal. The data must be kept true for at least 200 μ s after the leading edge of the PUNCH signal, or until READY goes to 0, but can then be changed to the next character at any chosen time prior to the next PUNCH signal. The PUNCH signal must have a minimum duration of 100 μ s or stay high until READY goes to 0, and there must be a gap of at least 200 μ s between the trailing edge of a PUNCH pulse and the leading edge of the following PUNCH pulse. A PUNCH order must however only be given when the interface is READY, otherwise the character will be ignored.

4.1.2 Handshaking

This mode of operation is suitable for data sources which can provide the next character within a block, as soon as requested to do so by the punch station interface. The minimum time available between the leading edges of PUNCH and READY is 8 ms.

4.1.3 Open Loop, 0 - 40 char./s (0 - 25 char./s)

If the data source is incapable of recognizing a READY signal, the punch station can be operated by means of the PUNCH signal alone. It is of course imperative that the actual maximum speed of the punch station is not exceeded by the data source. Thus the data source must ensure a separation of at least 25 ms (40 ms) between the leading edges of each and every PUNCH pulse.

4.1.4 TAPE ERROR

A tape error condition (i.e. tape out or taut tape) will inhibit the next READY signal and thus stop the transfer of data if a handshaking mode of operation is being employed. The TAPE ERROR signal (pin 20, parallel connector) goes high, the ERROR lamp lights, and punching is stopped. In all modes of operation, the TAPE ERROR signal can be used to stop data transfer if the data source is capable of recognizing such a signal.

If it is desired to punch out the characters in the buffer, TAPE FEED should be activated momentarily. This causes the contents of the buffer to be punched out. RESET can now be depressed and punching resumed.

4.2 SERIAL OPERATION

4.2.1 Timing Diagram (See Fig. 4.2)

The timing diagram for a generalized serial input is shown in Fig. 4.2. Serial data can be fed into the RD terminal as well as the Rx + or Rx - terminals (current loop).

Baud rates of 110, 150, 300 or 600 bits/s are selectable on the pcb.

4.2.2 Handshaking

This mode of operation is suitable for data sources which are capable of recognizing the DTR signal.

4.2.3 Open-loop

If the data source is incapable of recognizing a DTR signal, the punch station can run open-loop. In this case, it is best to keep the Baud rate under 300 bits/s.

4.2.4 Error

As for parallel operation, a taut tape or tape out condition will stop the punching. In addition, a parity, framing or overrun error will also stop the punching. The ERROR lamp will light, and DTR goes low while SRTS goes high for approx. 250 ms. If an ERROR has occurred, and it is desired to punch out the data stored in the buffer, TAPE FEED should be activated before pressing RESET.

4.2.5 Remote Control

The punch station can be switched on-line or off-line by a DC2 and DC4 signal respectively. To enable the DC2/DC4 mode, J7 must be connected as given in Fig. 3.5a.

When enabled, a DC2 signal must be sent before any data will be punched. The DC2 signal itself is not punched. When DC4 is sent, all following data will be ignored. The DC4 signal itself is not punched. When DC2/DC4 is disabled, the punch is always on-line.

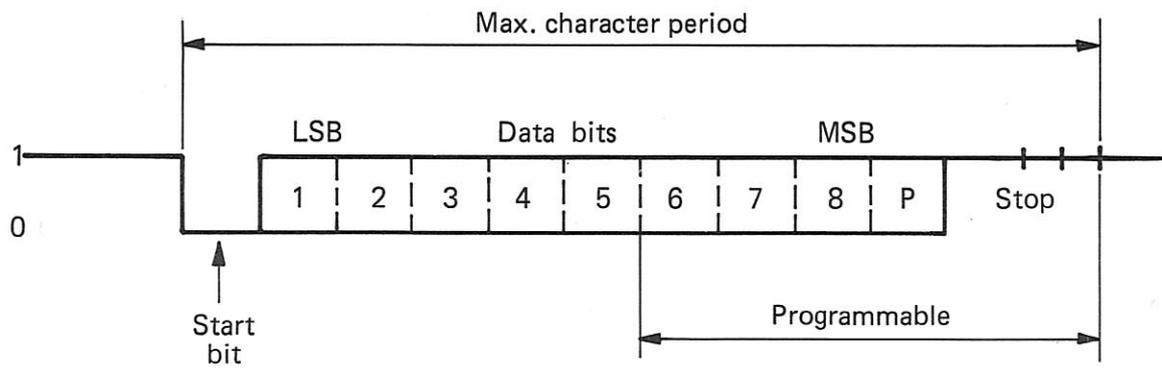


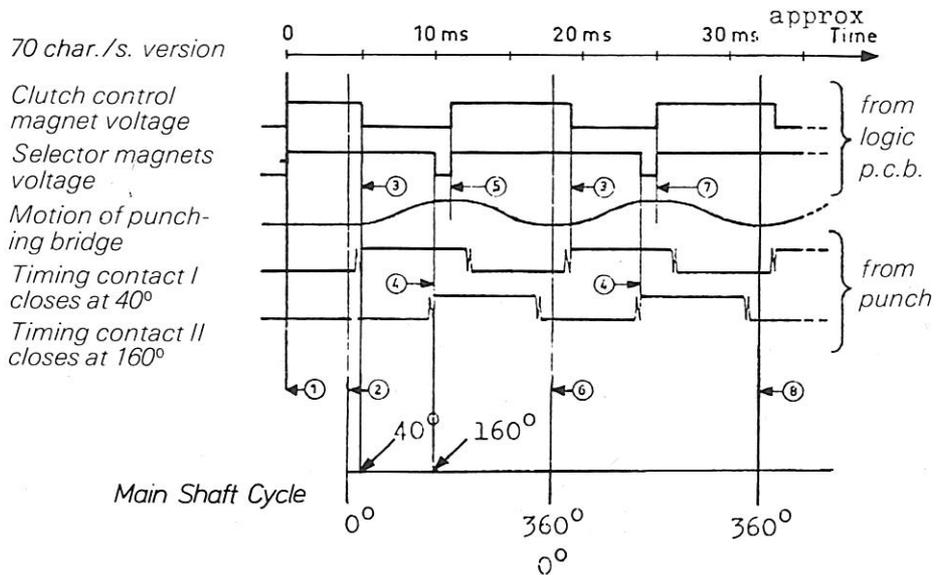
Fig. 4.2 Timing Diagram, Serial Operation

Each character period consists on one start bit, five to eight data bits, an even an odd or no parity bit, and one, one-and-a-half, or two stop bits.

*For 5 channel operation, note that the positions of the least significant bit and the most significant bit are reversed on the tape.

Continuous operation:

Example showing timing of the pulses for the clutch control magnet and the selector magnets.



At 70 char./s. the cycle time is $\frac{1}{70} = \text{approx. } 14\text{ms.}$

- 1: First character starts
- 2: The punch starts running
- 3: Clutch control magnet voltage off
- 4: Selector magnets voltage off
- 5: Second character starts
- 6: First cycle completed
- 7: Third character starts
- 8: Second cycle completed

SECTION 5
TECHNICAL DESCRIPTION

5.1 MECHANICAL DESIGN

5.1.1 General

The low profile metal cabinet of the GNT 3406 Tape Punch Station houses the following sub-assemblies:

A GNT 34 Punch, the motor of which is used also to drive the tape handler system.

A tape handler system designed for automatic loading and take-up of the tape.

Electronic circuits comprising power supply and microprocessor parallel/serial interface.

The Punch Station is designed for front panel loading, unloading and operation. It is well suited for mounting in a standard 19" rack and a kit for this purpose is available as an option.

5.1.2 GNT 34 Punch, Basic Description

The punch consists of two main units, a motor unit and a punching unit. The motor torque is transmitted by a drive belt, via an electro-magnetically operated clutch to the tape punching and transport mechanism and by another drive belt to the tape take-up system (see Section 5.1.3).

The tape punching mechanism comprises 8 or 6 (for TTS) knives which are controlled by a selector unit containing 8 electro-magnets.

The punch also has two timing contacts which are operated by the main shaft and indicate where the punch is in its mechanical cycle. Timing contact I closes at 40° (see Fig. 5.1) and indicates that the clutch magnet should be de-energized. Timing contact II closes at 160° (see Fig. 5.1) and indicates that the selector magnets should be de-energized. Note that 0° in the main shaft cycle occurs 4 ms after starting, this being the activation time of the clutch magnet.

The punch is fully described in Section 5.1.4.

5.1.3 Tape supply and take-up (See Fig. 5.2)

From the supply roll on the lower disc (which is not connected to a drive mechanism, but merely rotates as the tape unwinds), the tape passes behind a spring loaded tension arm roller and through the punch head. The tension arm follows the tape movement. When the tape is slack, e. g. when punching stops, the tension arm is pulled backwards by the spring and applies a brake to the tape supply disc. If during punching, a taut tape condition occurs, the tension arm is pulled forward, thereby activating a micro-switch. The micro-switch then generates a tape error indication and signal (see Section 5.2.2.3). Having passed through the punch head, the tape passes behind a transparent plastic flap, unless it is being led out through the front cover (see Section 3.7). Inside the guide box, the tape runs round a sprung roller unit. When there is slack tape to be taken up (as there will be initially), the roller unit is pulled backwards by the spring, and by means of an interconnecting rod presses a drive wheel against a capstan (which is continuously driven from the punch unit motor by means of a belt). As the drive-wheel also presses against the rim of the take-up disc, the take-up disc rotates. The tape emerges from the tape guide box at the upper level, passes across the top of the punch head, and is led along a guide arm to the core on the take-up disc. The guide arm presses the tape against the core and causes take-up to start. As the slack tape is wound up, the sprung roller unit in the guide box is pulled forward to a point where the interconnecting arm causes the drive-wheel to disengage from the capstan. Take-up then ceases, until new slack is generated by more tape being punched.

The chad box is equipped with a sweeper so as to ensure full utilization of the available space. This sweeper is driven from the hub of the supply disc by means of an eccentrically mounted connecting rod. Thus the sweeper functions when punching is in progress, irrespective of whether the take-up disc is being used. If the chad box is allowed to become full up, the force needed to move the sweeper will become so high that a taut tape condition results, and TAPE ERROR is generated as previously described.

When the tape supply is exhausted and the last tape has passed the tension arm roller, this roller will be pulled through a slotted plate by the spring, thereby activating a micro-switch. The micro-switch then generates a tape error indication and signal (see Section 5.2.2.3).

The supply disc is equipped with a tape low arm which senses the radius of the roll and activates a micro-switch when a predetermined quantity of tape remains. The micro-switch then generates a tape low warning and signal (see Section 5.2.2.4).

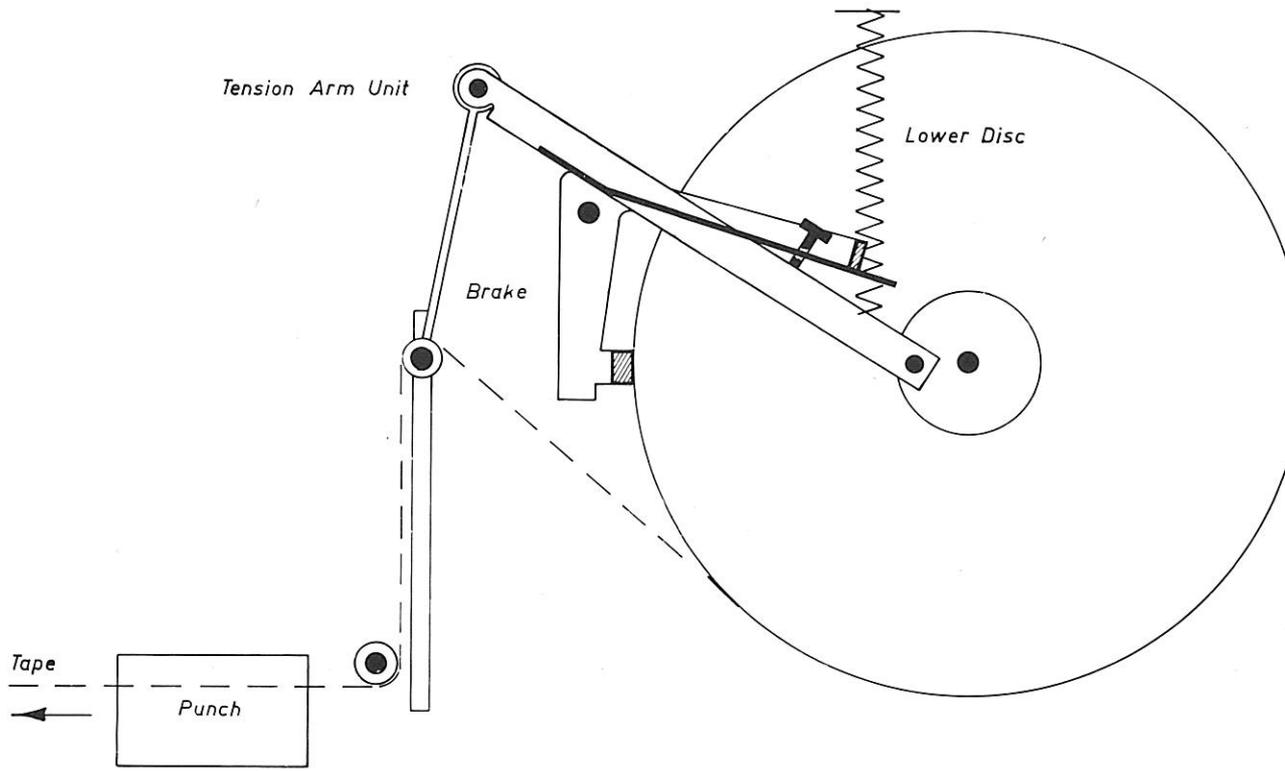


Fig.5.2 Fig. 5.2a Slack Tape (Disc Braked)

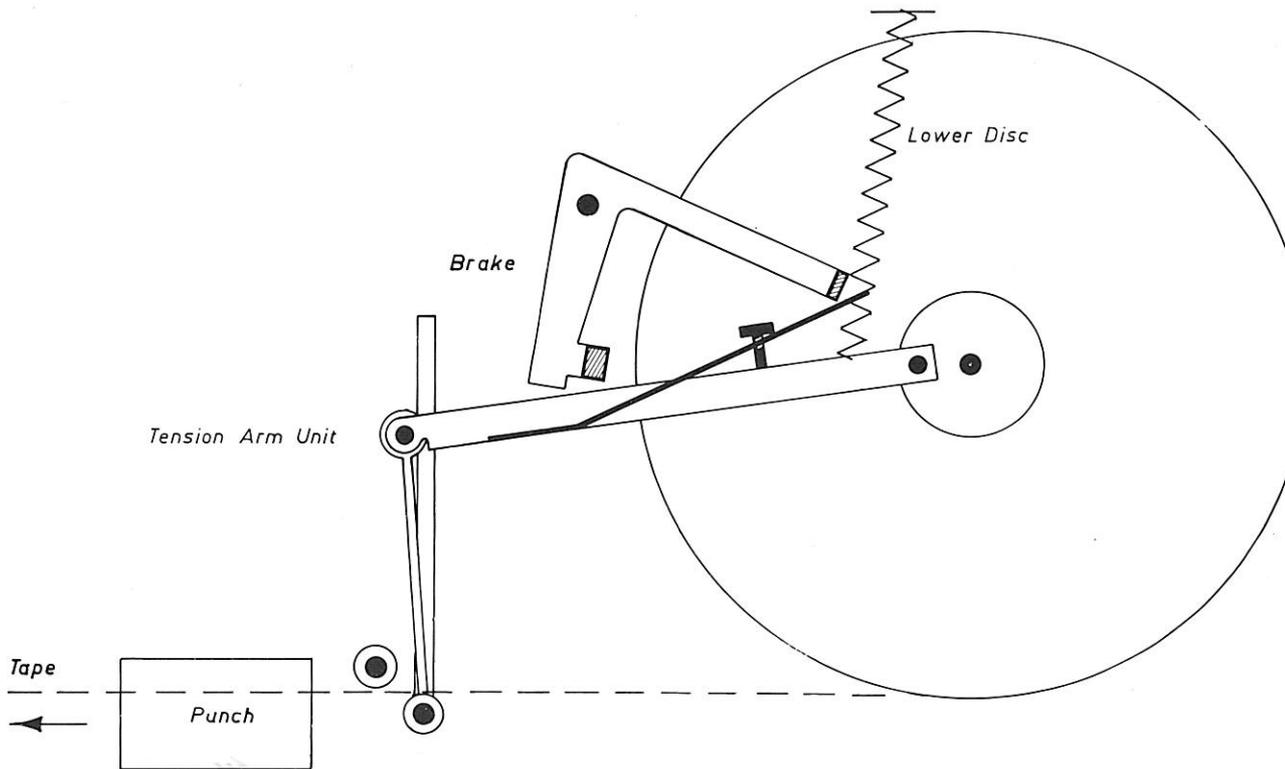


Fig. 5.2b Taut Tape

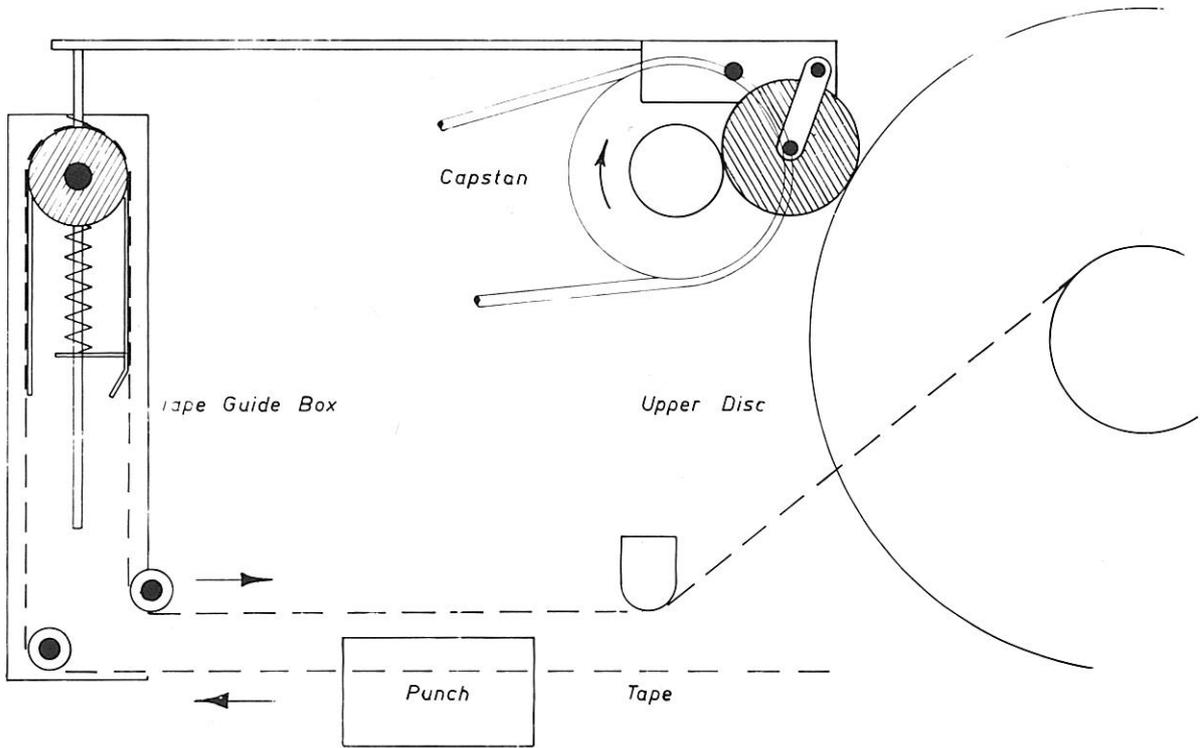


Fig. 5.2c Slack Being Taken Up (Driving)

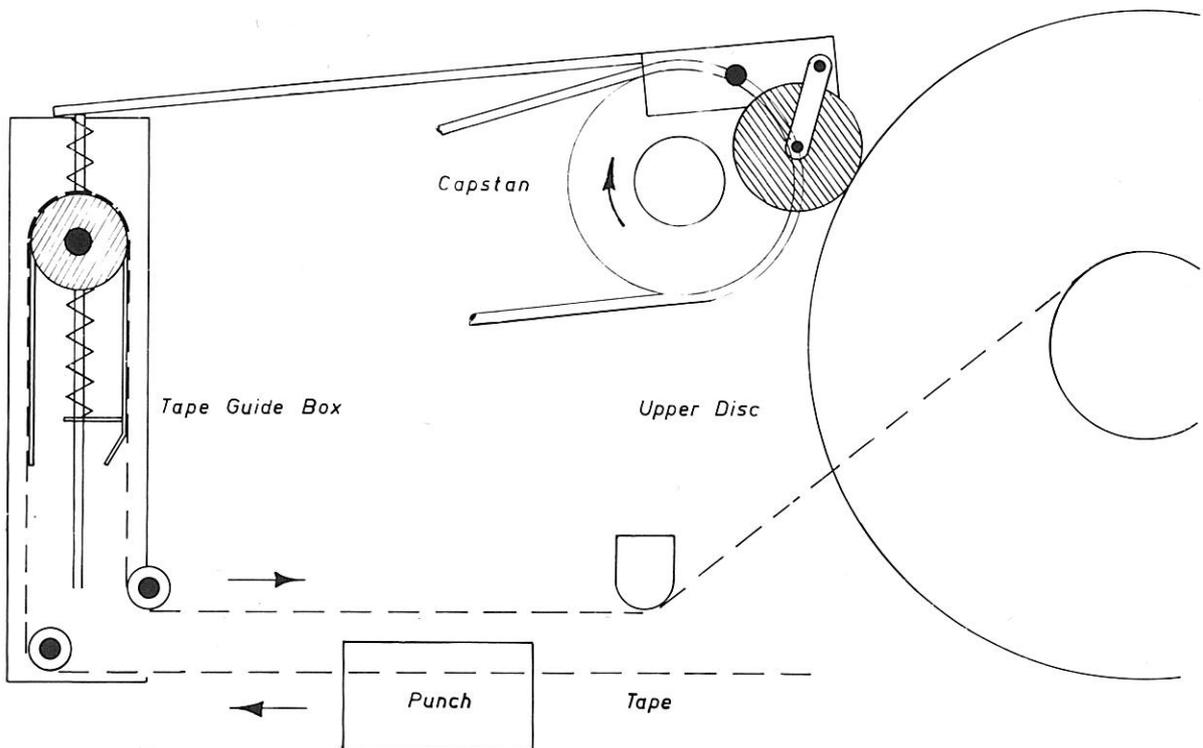


Fig. 5.2d No Take-up (Idle)



5.1.4 GNT 34 PUNCH, Detailed Description

N.B. In this section "up and down" and "forwards and backwards" are defined in conventional manner for the GNT 34 punch as meaning respectively "towards and away from the tape" and "corresponding and opposing the direction of tape travel". Thus, "up" means "outwards" relative to the punch station and so on.

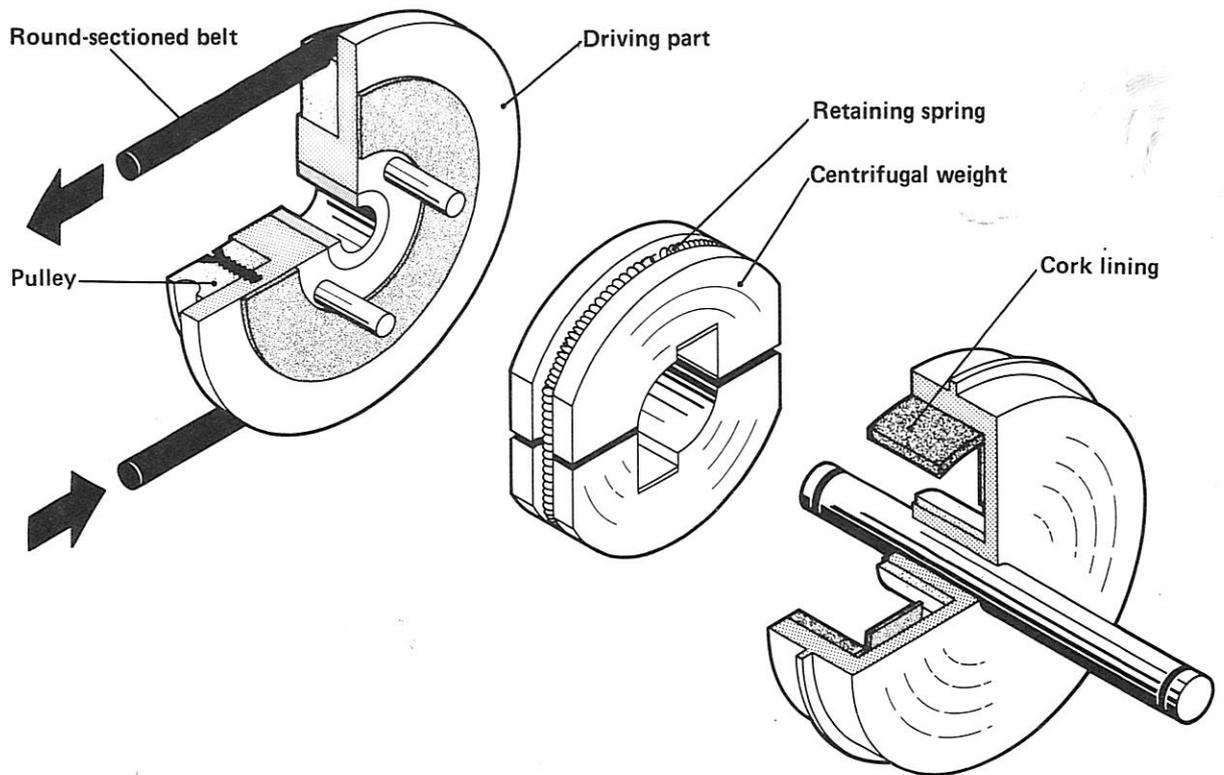
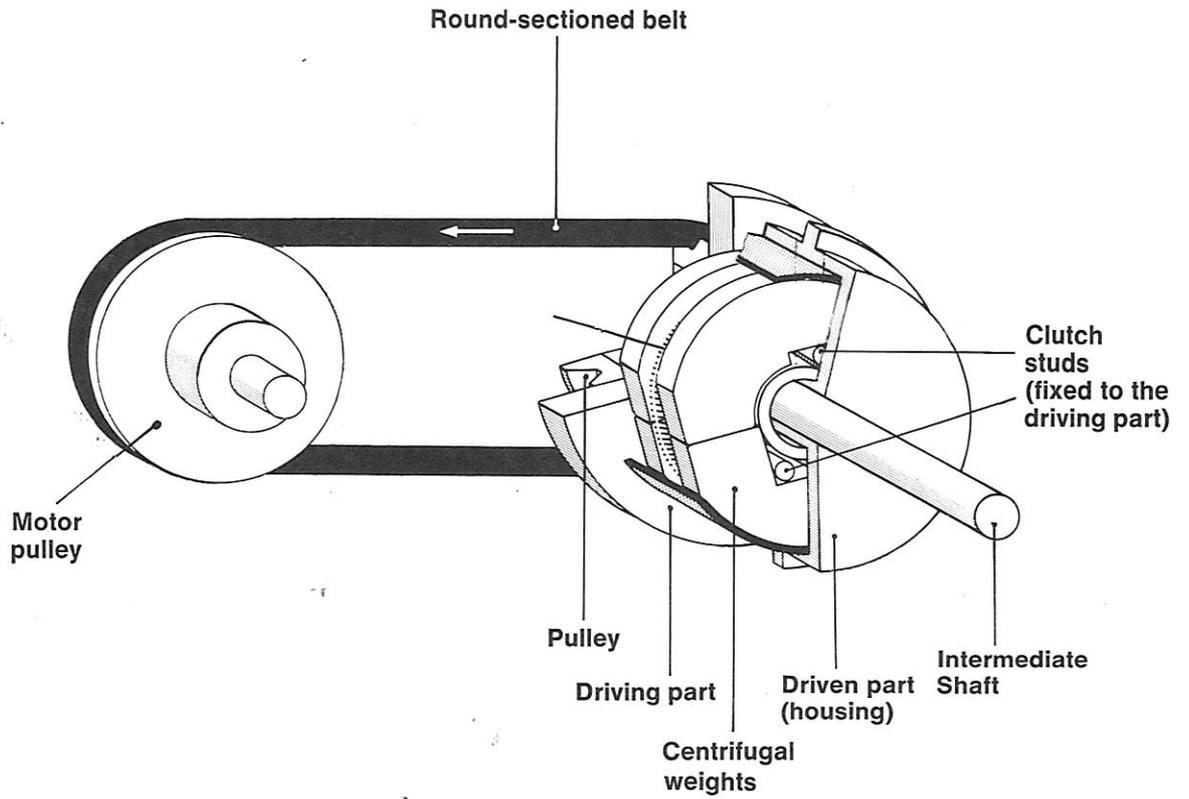
a) **Motor**

The motor is single phase, with two windings, a capacitor and a built-in thermal cut-out. The motor unit is easily removed using only a screwdriver.

b) **Power Transmission (See Fig. 5.3)**

Motor torque is transmitted to the punch unit via a round-sectioned drive belt and the pulley and driving part of a centrifugal clutch. Two studs on the inner face of the driving part engage cut-outs in two centrifugal weights, thereby causing them to rotate. When the motor reaches 2200 rpm., the weights move outwards against the restraining action of the retaining spring and engage with the corked-lined surface of the driven part (housing), thus transmitting torque to the driven part and the flat belt which rides on its circumference.

The clutch assembly is mounted on a shaft which rides on ball bearings. Motor torque to the tape handler system is transmitted via a second round-sectioned drive belt.



c) **Punch Control (See Fig. 5.4)**

From the flat belt, torque is transmitted to the main shaft via an electro-magnetically actuated control clutch. The driven part of this control clutch is keyed to the main shaft and thus to the punching mechanism. The driven part has 3 prongs*, two of which are situated close to, but not touching, the driving face of the clutch pulley. In the stop position (shown) these two prongs are positioned so that they are not in contact with the flat drive belt. The third prong (the brake prong) is formed in the opposite direction to the other two and is held fast by the pinching action of the clutch lever against the two plastic brake rings and the support ring.

The stop position is thus maintained until the clutch magnet is energized. When this occurs, the pawl is released, and the clutch lever rotates about its pivot under the action of the clutch spring. The brake prong is now no longer pinched between the brake rings, and the start spring turns the connecting rod, main shaft and three-pronged driven part. The first prong rotates into engagement with the inner surface of the drive belt and the pulley, and the flat belt continues to drive the clutch, the main shaft and the rest of the punching mechanism.

During the rotation, the second prong is engaged, and thus the 360° cycle is driven to completion. During the cycle, the clutch magnet is de-energized, and the clutch lever is mechanically reset when the reset bushing on the connection rod pushes against a shoulder on the clutch lever. The clutch lever is thereby re-latched by the pawl and is held in this position. At the end of the cycle, the brake prong is arrested by the pinching action of the clutch lever on the brake rings (if the magnet has not been re-energized in the meantime, in which case another cycle will be initiated).

During the punching cycle, the brake rings are free to rotate, whereby wear is distributed evenly over the surfaces of the rings.

* There is also a tab which merely holds the brake rings in place.

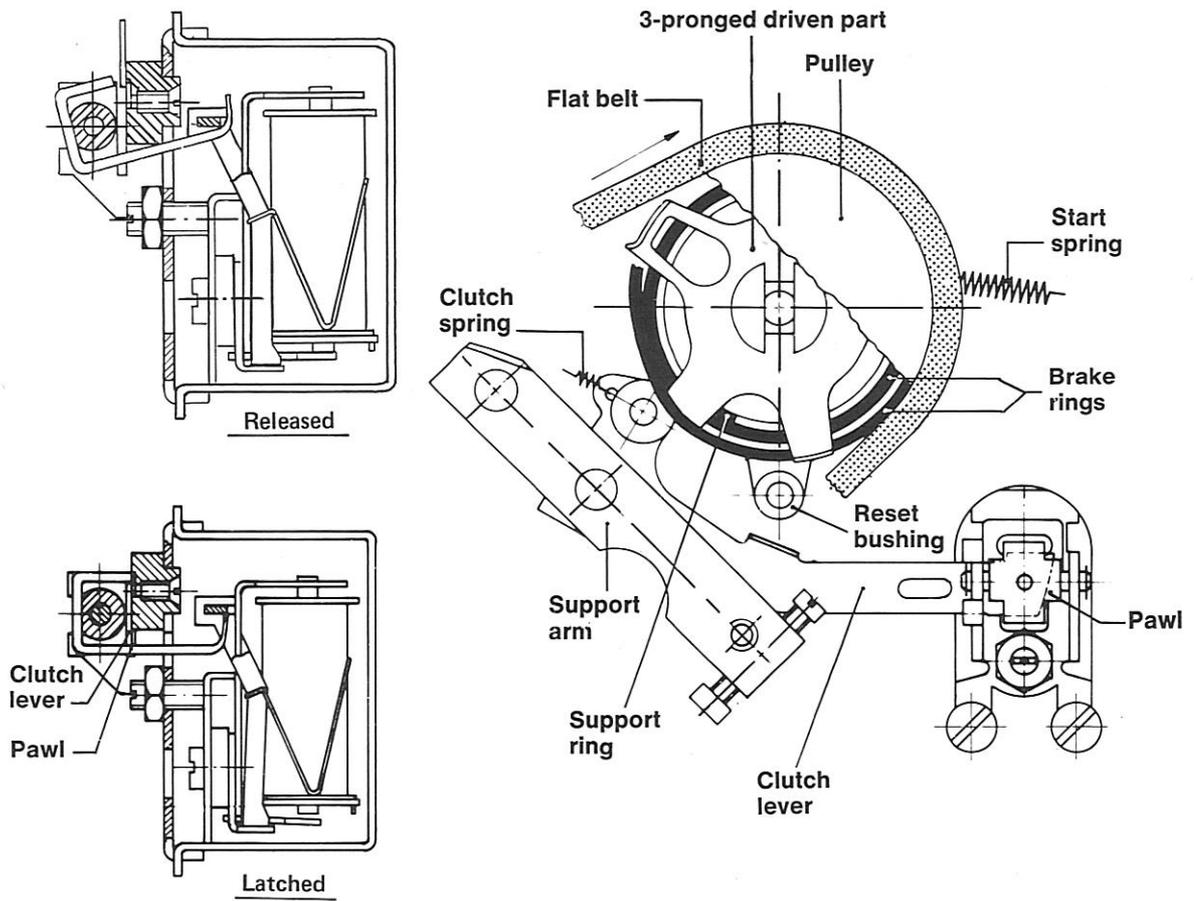


Fig. 5.4a Electro-magnetic Control Clutch (seen from the belt side)

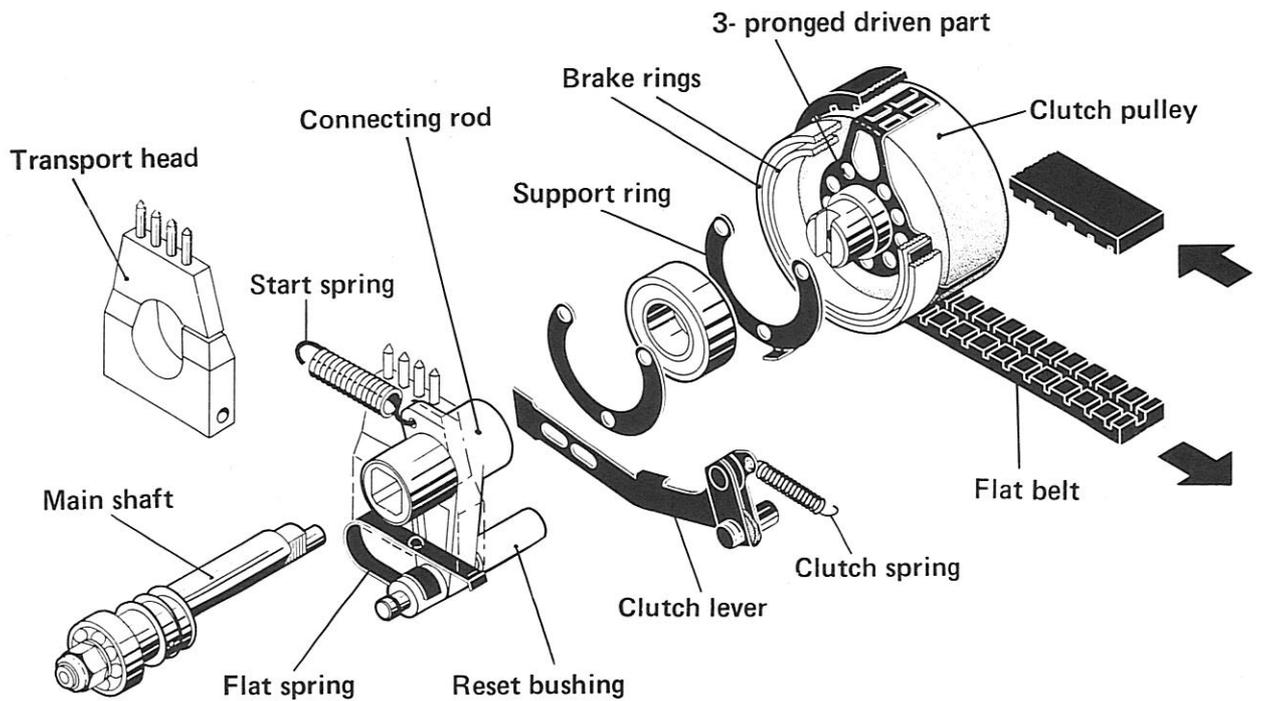


Fig. 5.4b Electro-magnetic Control Clutch (seen from the side opposite the belt)

d) Punching Mechanism (See Fig. 5.5)

The punching mechanism is mounted on an aluminium chassis which is integral with the tape platform.

The three-lobe main shaft fits into a square hole in the connecting rod. (See also Fig. 5.4). When the main shaft rotates, the transport head describes a square as shown by the dotted lines. The four transport pins on the head are engaged in the tape feed holes during steps 1 and 5 of the cycle. The pins are maintained perpendicular to the tape platform by means of a U-bracket which pivots on a fixed bearing. The flat spring ensures that the transport head is held up against the connecting rod, but allows the transport head to be retracted for tape insertion. (See Section 5.1.4f). The up-and-down motion of the connecting rod is transferred to the punching bridge and the punch knives via the rocker arm.

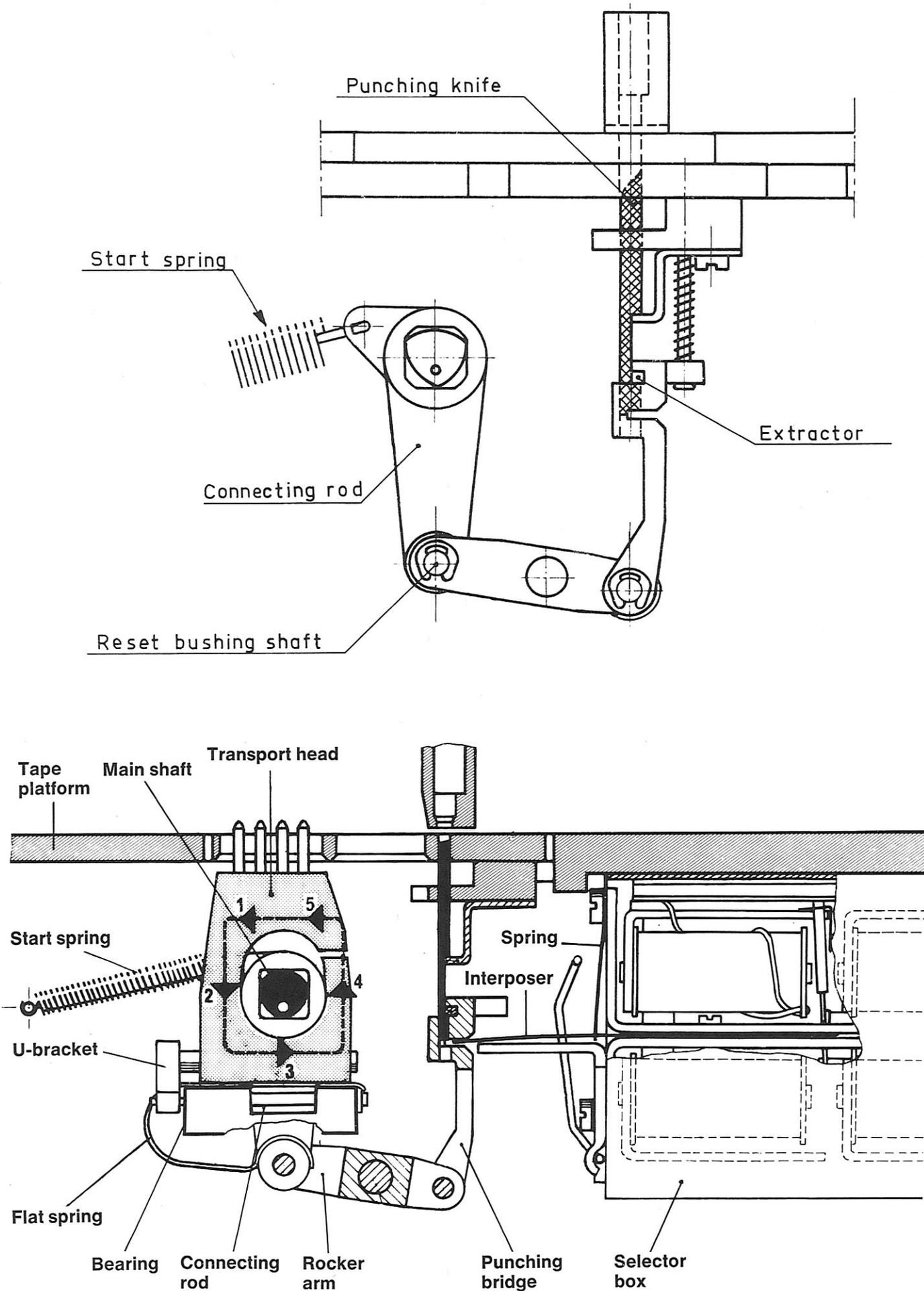
The process by which the knives are selected is described in the following section.

e) Selector Box (See Fig. 5.5)

The selector unit houses 8 electro-magnets. When the appropriate electro-magnets are energized, the corresponding interposers are pushed forward approx. 1 mm and slide into a slot in the punching bridge just beneath the lower ends of the punching knives. The interposers are flexible and follow the upward motion of the bridge. The knives which are selected by their corresponding interposers are therefore lifted upwards by the bridge and perforate the tape. Those knives which are not selected slide into holes in the bridge and remain down. The selector magnets are de-energized in the up position, and the springs withdraw the interposers as soon as they are free.

The feed and punch sequence is summarized in Table 1.

STEP NO.	FEED MECHANISM	PUNCH MECHANISM
1	Transport head and tape move forwards 1/2 pitch (approx. 1.27 mm).	The selector solenoids are energized, and the interposers move forwards if a hole in the respective channel is to be punched. The punch knives are stationary.
2	The transport head retracts.	The punch knives, held by the interposers and driven by the punching bridge, move upwards and pierce the tape.
3	The transport head moves backwards one pitch (approx. 2.54 mm).	The selector solenoids are de-energized, and the interposers retract as soon as they are free. The knives remain in the upward position.
4	The transport head rises, and the pins engage in the feed holes.	The punch knives are withdrawn from the tape by the extractor during the downwards movement of the bridge.
5	The transport head and tape advance 1/2 pitch (approx. 1.27 mm).	No movement of the punch knives.



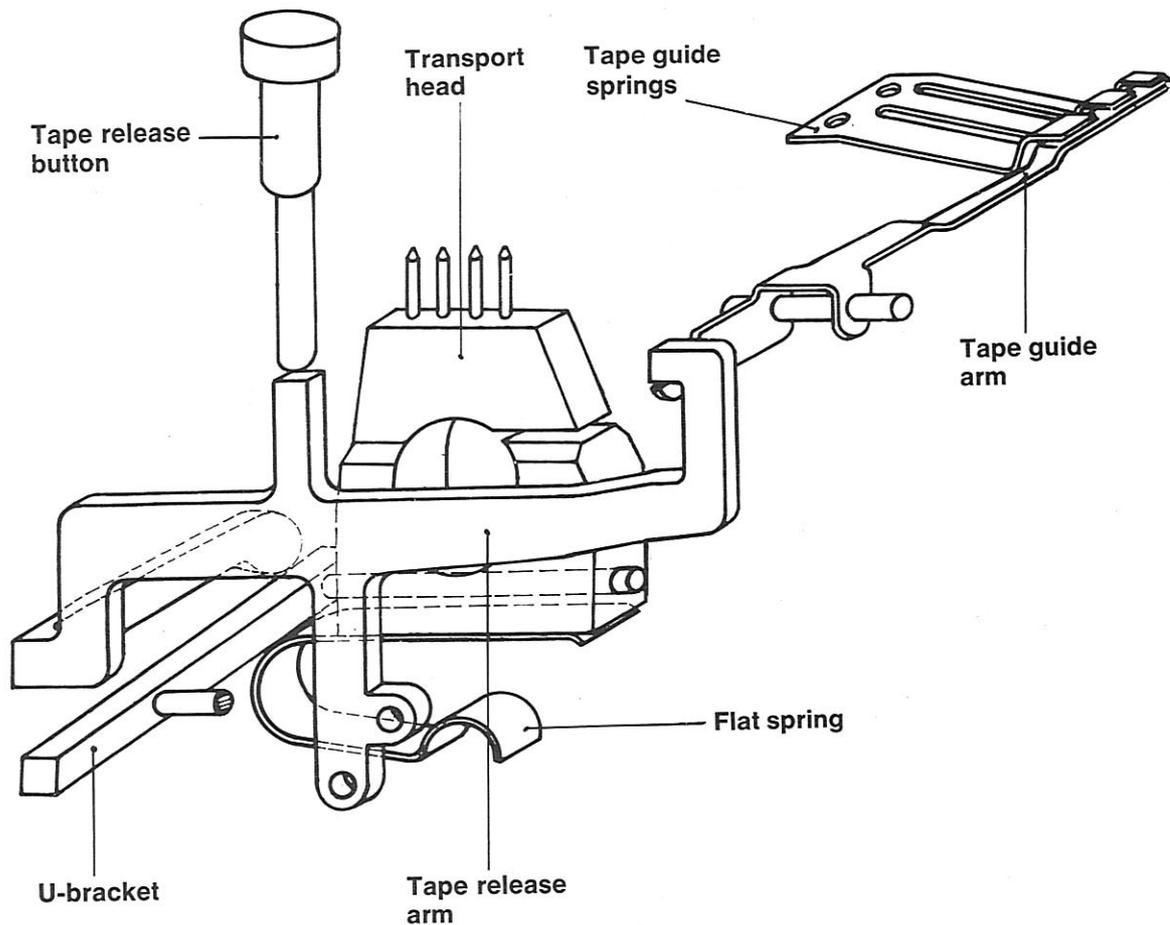


Fig. 5.6 Tape latch

f) **Tape Latch (Fig. 5.6)**

The tape guide springs press the tape against the platform and prevent undesired sliding. Depending on the width of the tape, one of the outer springs will be next to the tape edge, thereby acting as a guide.

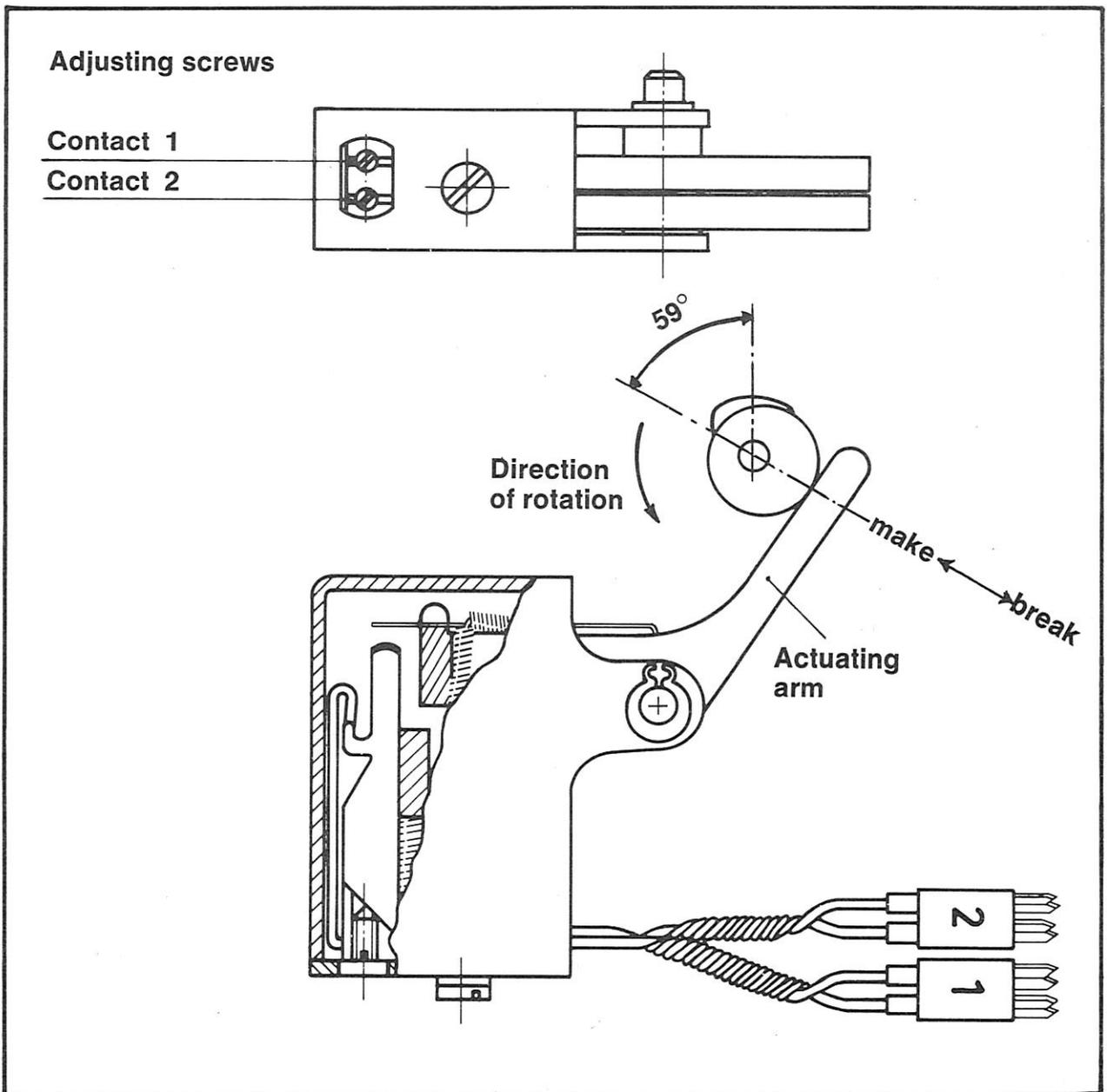
When tape is to be inserted into the punch, the transport pins must be retracted and the tape guide springs lifted.

Depressing the tape release button moves the tape release arm downwards. The right end of the tape release arm actuates the tape guide arm, thereby lifting the three tape guide springs.

The left end of the tape release arm rides on the U-bracket and forces the transport head down and out of engagement with the tape. The transport head is able to move downwards because the hole in it is oblong, and only the lower half is held against the connecting rod by the flat spring. (See Section 5.1.4d).

g) **Timing Contacts (See Fig. 5.7)**

The GNT 34 Punch has two timing contacts which are actuated by two cams on the main shaft and indicate where the punch is in its mechanical cycle. Timing contact I closes at 40° (see Fig. 5.1), and indicates that the clutch magnet should be de-energized. Timing contact II closes at 160° (see Fig. 5.1), and indicates that the selector magnets should be de-energized. Note that 0° in the main shaft cycle occurs 4 ms after starting, this being the activation time of the clutch magnet.



5.2 ELECTRICAL DESIGN

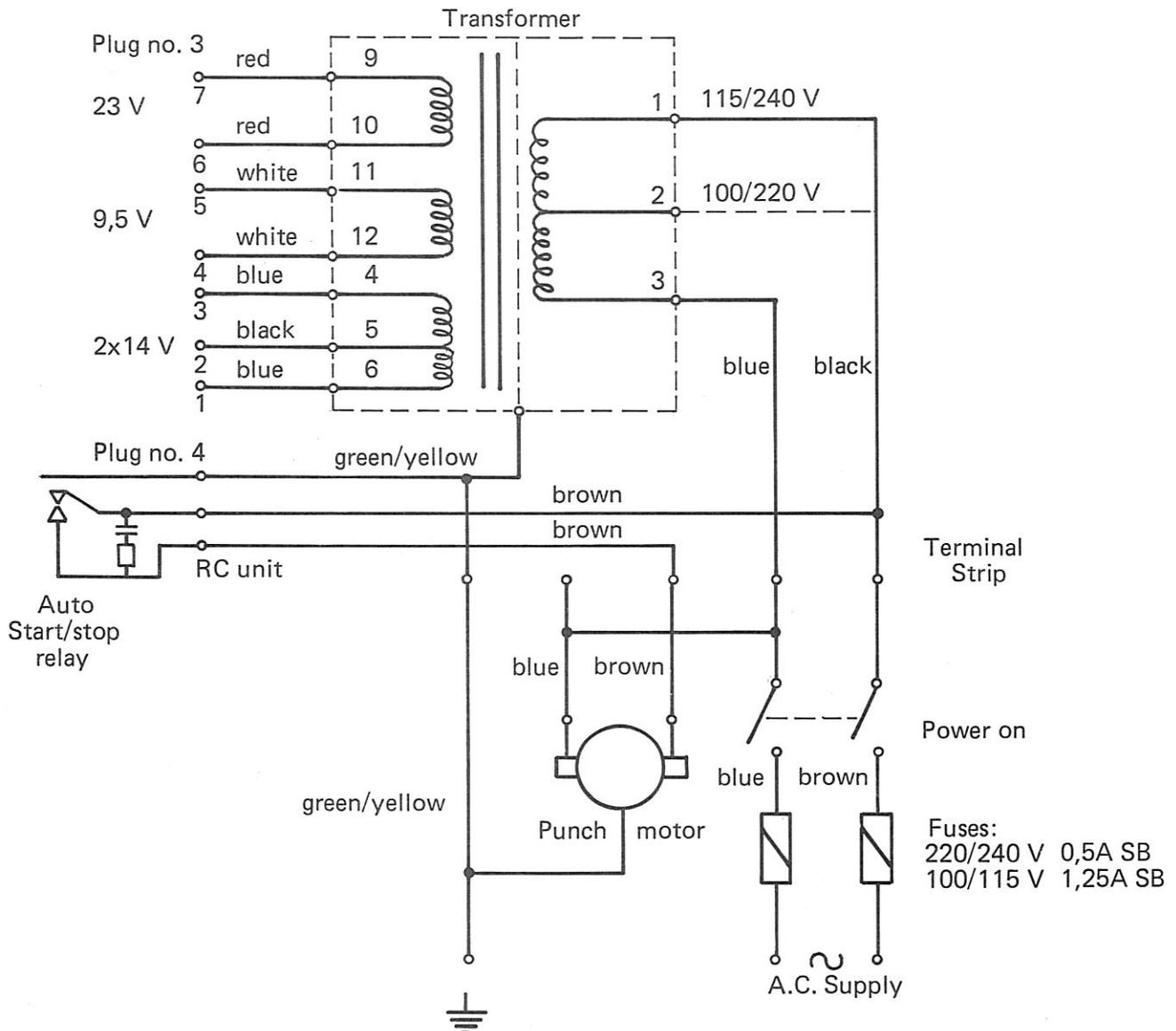
5.2.1 Power Circuitry (See Fig. 5.8 and 5.9)

The a. c. supply passes via 2 slow-blow fuses and a double-pole power switch to the punch motor (via the auto start/stop relay) and to the primary of the power transformer. A degree of a. c. supply filtering is provided by an RC circuit.

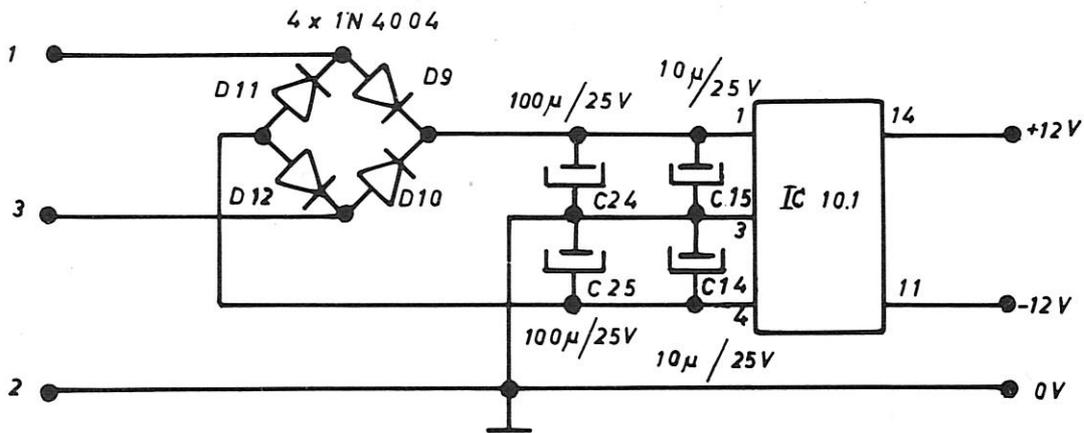
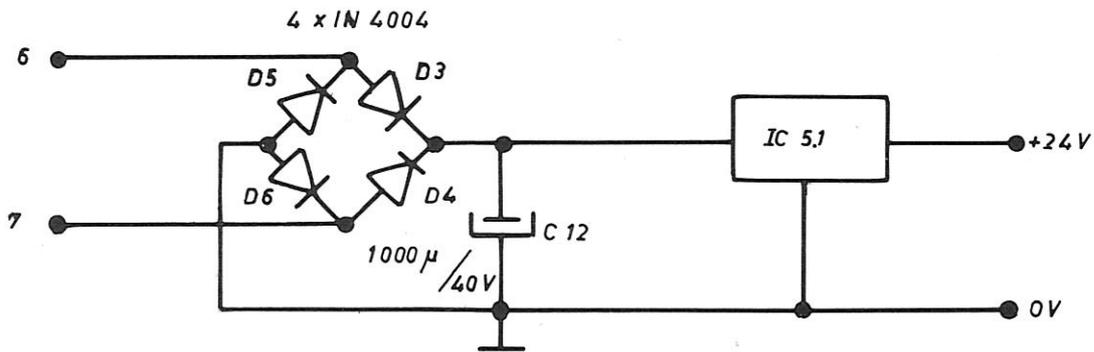
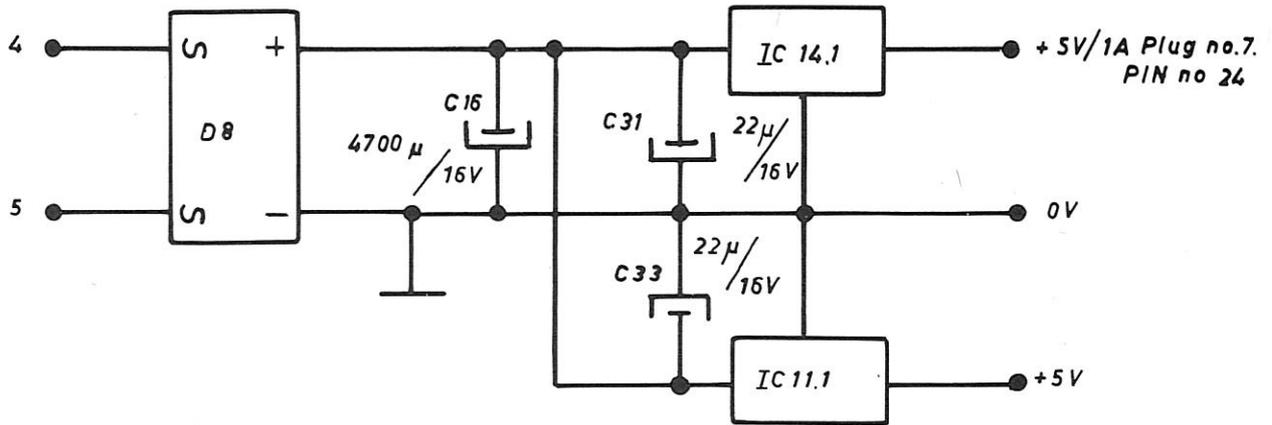
The 23 V output is rectified by D3, D4, D5 and D6 and smoothed by C12. The resulting d. c. supply is regulated by IC 5.1. The output of the circuit is a constant 24 V.

The 9.5 V output is rectified by D8 and smoothed by C16, C30 and C31. The resulting d. c. supply is regulated using two integrated regulating circuits, IC 14.1 and IC 11.1, thereby producing two 5 V supplies. The output of IC 11.1 is used internally, while the output of IC 14.1 provides a 5 V/1 A supply for additional electronics. The POWER ON lamp is connected directly across the internal 5 V supply.

The output from the center-tapped 28 V winding is rectified by D9, D10, D11 and D12 and smoothed by C14, C15, C24 and C25. IC 10.1 provides a regulated ± 12 V output.



Plug no. 3



IC 5 LM 340 T-24
 IC 10 SE 5553-N
 IC 11-14 LM 340 T-5

5.2.2 Interface Circuit (See Fig. 5.10)

The interface is built up around Intel's 8048 or 8748 micro-processor and 8156 RAM and I/O expander.

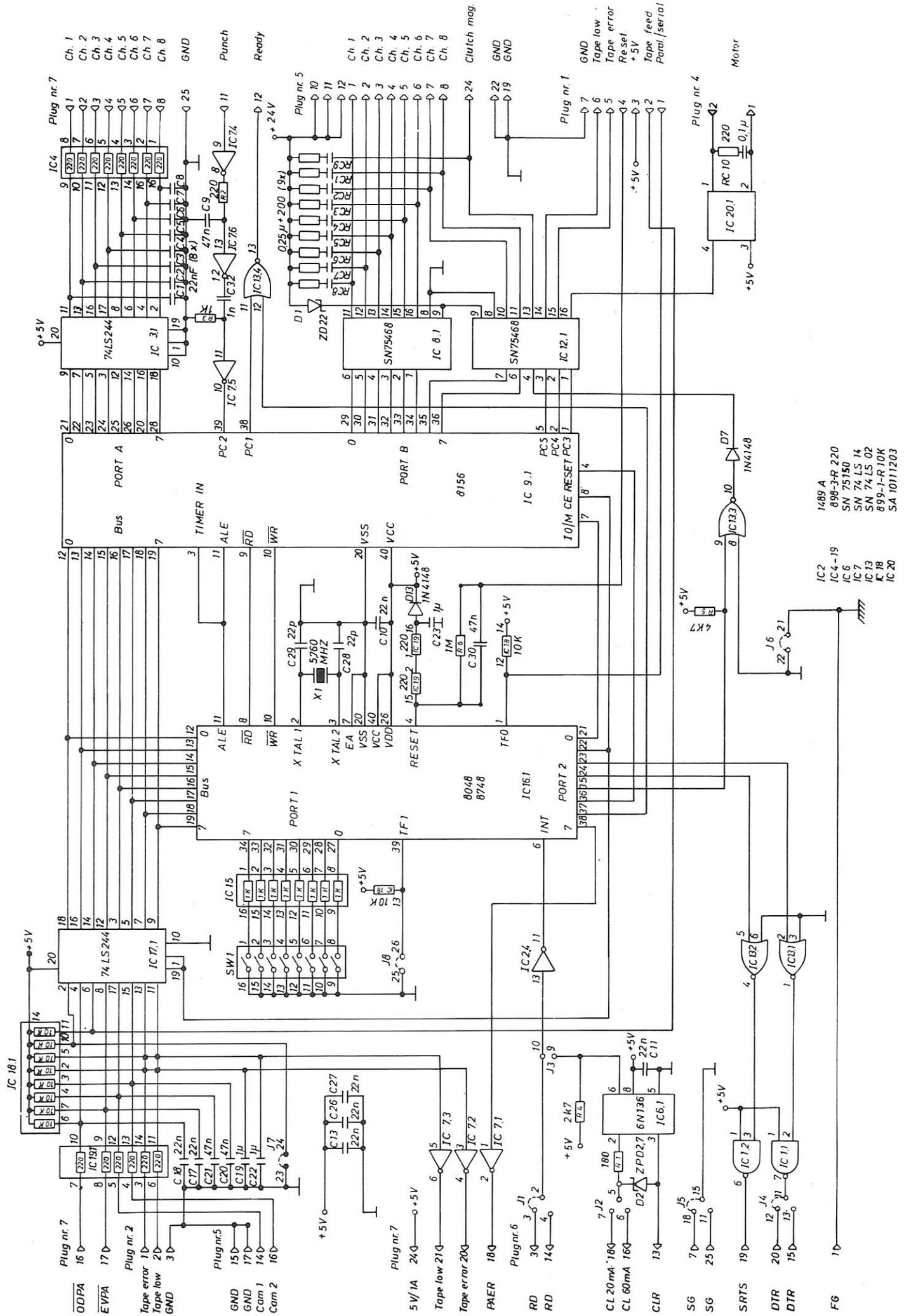
Two 74LS244's (IC 17.1 and IC 3.1) are used as line drivers, and two SN75468's (IC 8.1 and IC 12.1) are used to drive the magnets, control lamps and auto start/stop relay (IC 20.1).

The 6N136 is an opto-coupler used as a current input.

BUFFER OUTPUT:

The following will cause all the stored information in the buffer to be punched:

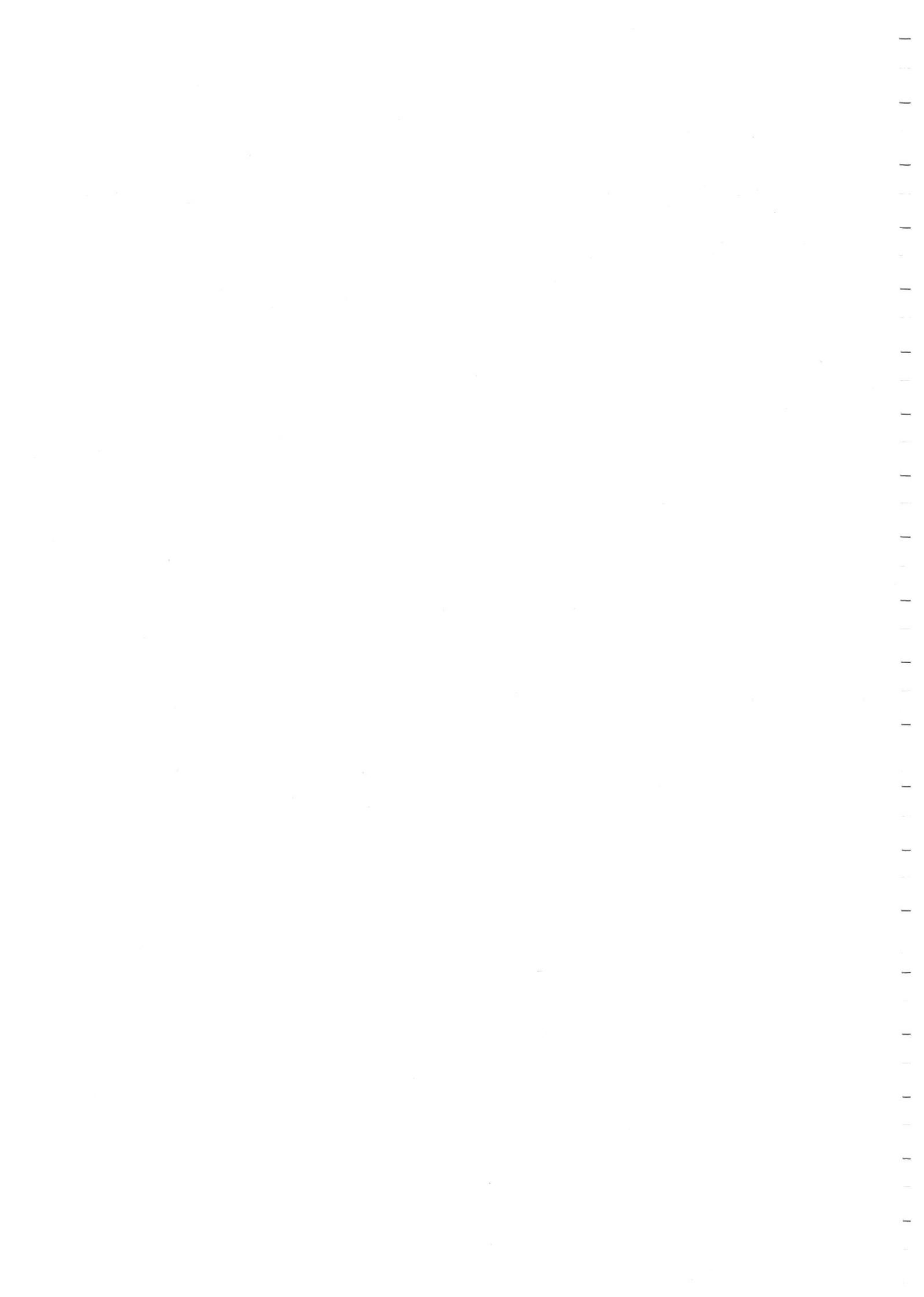
- 1: The number of stored characters reaches 256.
- 2: The time after the last character has entered the buffer exceeds 40 ms.



- 1489 A
- 896-3-R 220
- SN 75150
- SN 74 LS 14
- SN 74 LS 02
- 899-1-R 10K
- SA 10111203

- IC 2
- IC 4-19
- IC 6
- IC 7
- IC 13
- IC 18
- IC 20

Fig. 5.10 Interface Circuit Diagram



SECTION 6 **MAINTENANCE**

6.1 SERVICING

Every 6 months or after punching one hundred 1000 ft. rolls of paper tape, whichever occurs first, the Tape Punch Station should be serviced as described in the following:

6.1.1 Cleaning

Remove the tape guide box and open it. Clean it inside using a soft brush and a vacuum cleaner with a small nozzle. Be careful not to distort any part of the tape guide box. Remove the top cover (see Section 6.3.1), the upper disc and the Punch Unit (see Section 6.3.5). Clean all accessible parts of the inside of the cabinet, using the soft brush and vacuum cleaner. The transparent front cover should of course be in the open position, and the intermediate plate should be raised when cleaning the lower disc area.

To clean the punching mechanism, it must first be removed from the punch unit. See Section 6.3.7. Dismantle the punching mechanism as follows:

- a) Remove the selector box as described in Section 6.3.12, steps b and c.
- b) Remove the patch board as described in Section 6.3.9.d, and snap off the chad chute.
- c) Remove the one screw which holds the tape latch unit. Disengage the tape release arm, and remove the tape latch.

Clean the entire punching mechanism, taking special care with the following:

- a) Tape latch.
- b) Die block (upper plate of the punch set).
- c) Selector box (exterior only).
- d) Flat drive belt, round-sectioned belts and pulleys.
- e) Punch and feed mechanisms.

After having carried out the rest of the servicing procedure (see Section 6.1.2), the outer surfaces of the cabinet and the transparent front cover should be wiped clean using first a soft cloth wetted with a mild soap solution and then a clean soft cloth. This is first done after the punch station has been reassembled.

6.1.2 Lubrication

The punch unit is lubricated as follows:

Recommended lubricants:

Klüber grease: Type LDS 18 Special A
Esso Oil: Type MILLCOT K150

When ordering from GNT AUTOMATIC A/S or resellers, please specify:

MP3-00412, Klüber grease (100 g).
34/3061, Esso Oil, MILLCOT K150 (100 ml).

Lubricate the following points with Klüber Grease, LDS 18

- | | | |
|----|--|---------------------|
| a) | Control clutch | Fig. 6.1 |
| | Pawl and pawl axle | |
| | Clutch lever (shoulder and latch end) | |
| | Clutch lever spring | |
| | Reset bushing | |
| | Magnet armature bridge | |
| b) | Punch and feed mechanism | Figs. 6.2, 6.3, 6.4 |
| | U-bracket | |
| | Rocker arm (3 axles) | |
| | Transport head | |
| | Flat spring (on transport head and connecting rod) | |
| | Start spring (both ends) | |
| | Connecting rod (hole) | |
| c) | Timing cams | Fig. 6.3 |
| d) | Selector box | Fig. 6.5 |
| | Interposers (ends only) | |
| | Springs (tips only) | |

Lubricate the following points with Esso Oil, MILLCOT K150

- | | | |
|----|-----------------------------------|----------------|
| e) | Lubricating felt on clutch lever | Figs. 6.6, 6.7 |
| f) | Lubricating felt for punch knives | Fig. 6.2 |
| g) | Main shaft ball bearing | Figs. 6.6, 6.7 |

N.B. The other parts of the punch station will not normally require any additional lubrication. However, should lubrication be required, e. g. after replacing certain parts, or after years of arduous operation, the following lubrication chart should be adhered to.

Lubricant

Klüber grease - Type LDS 18, Special A (GNT Automatic order No. MP3-00412).

Lubrication points (L)

Roller unit bearings in tape guide box, see Fig. 6.8.

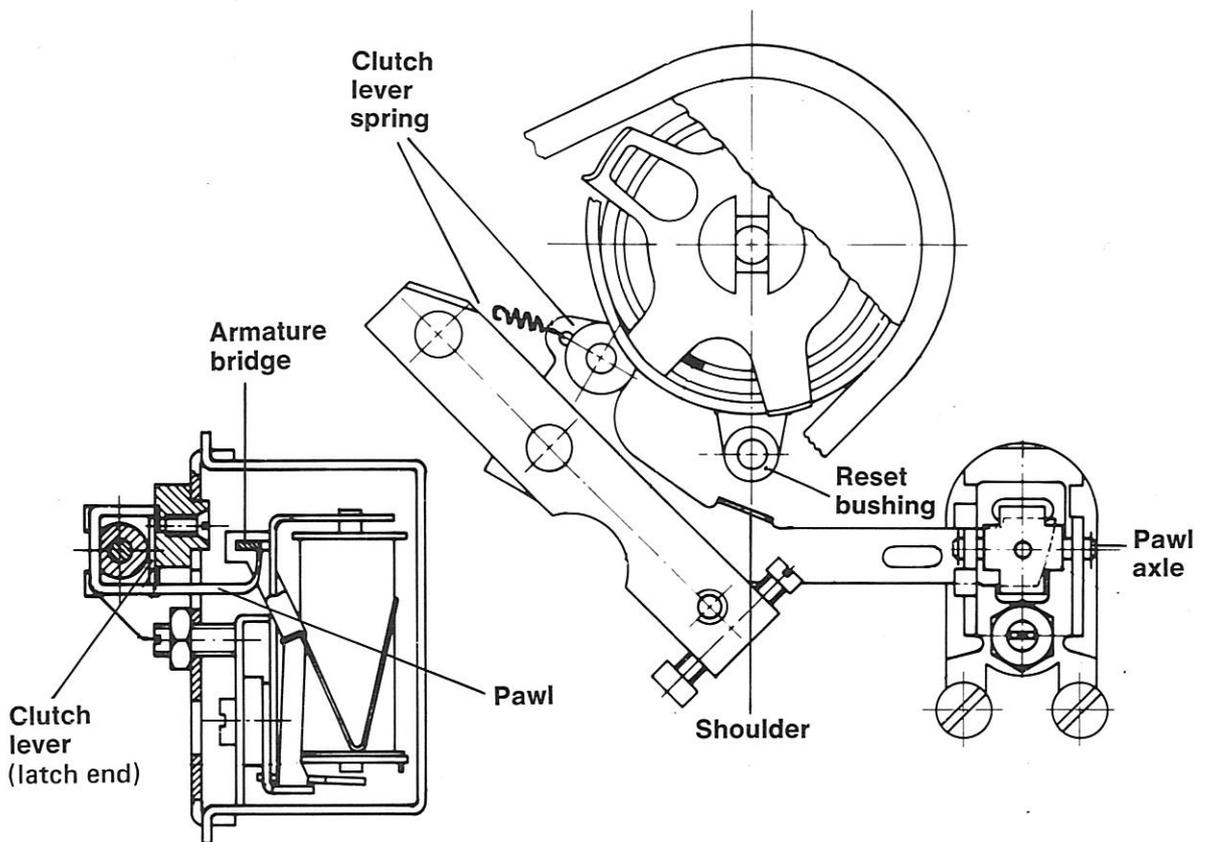
Plastic bearing for chad box sweeper connecting rod, see Fig. 6.24.

Tension arm unit bearings, see Fig. 6.21.

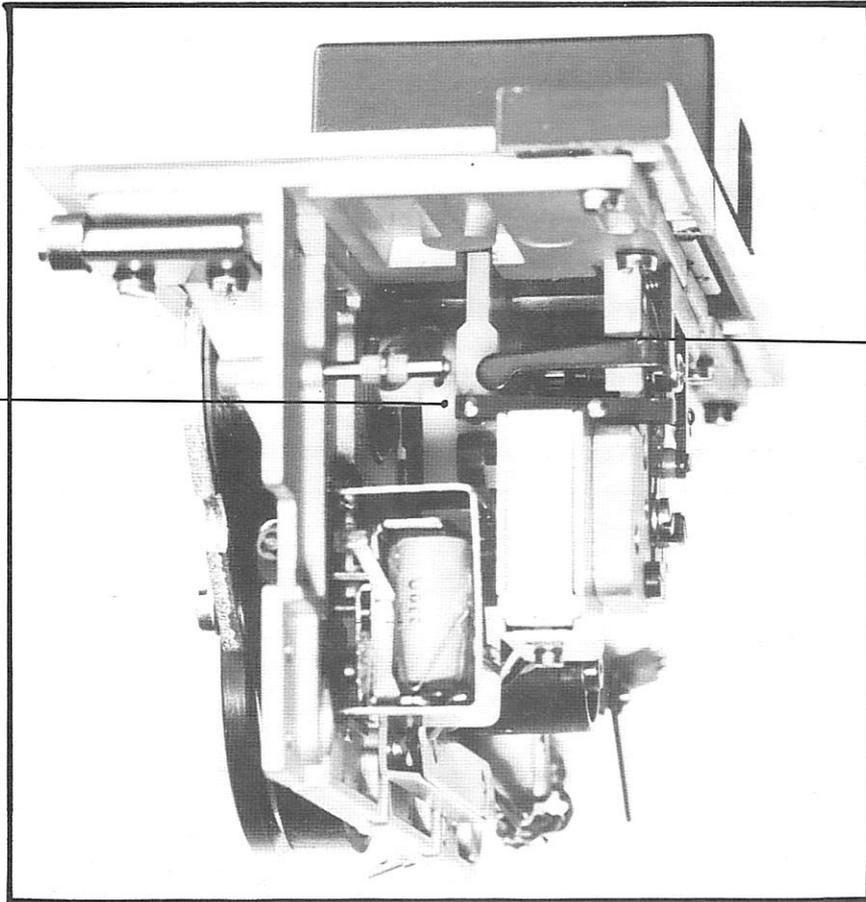
Brake arm, bearing and mating surface with leaf spring, see Fig. 6.21.

The "eyes" of all coil springs.

N.B. All other areas should be kept free of lubricants.

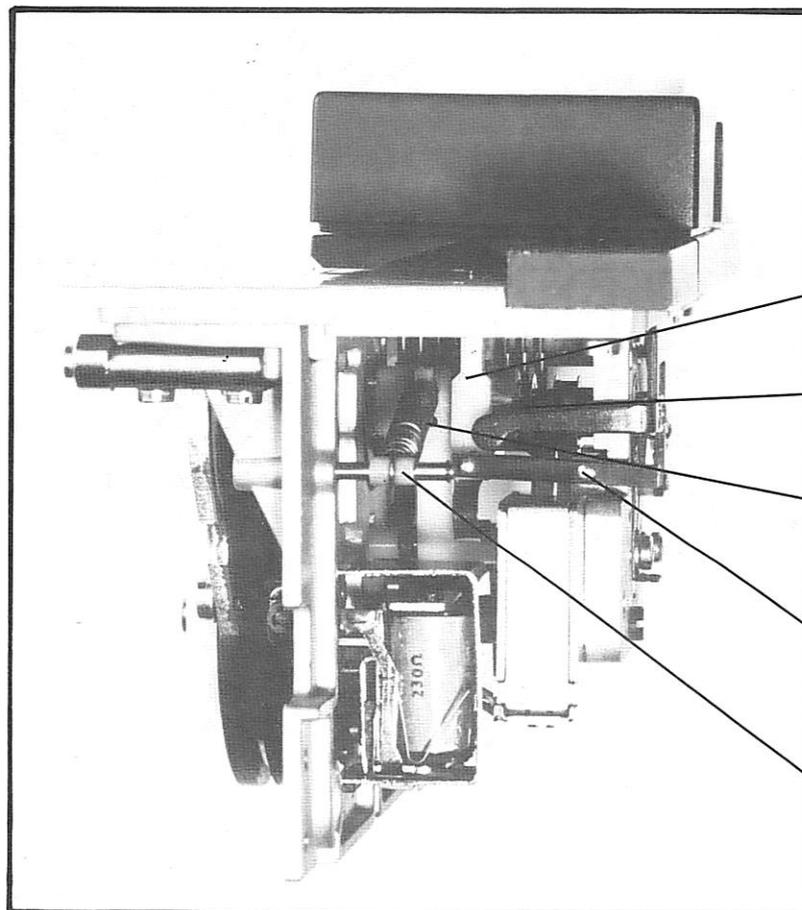


LDS 18
Flat spring
(under transport
head and on
connecting rod)



K 150
Felt
for
punch
knives

Fig. 6.2 Lubrication B



LDS 18
Transport head

LDS 16
Timing Cams

LDS 18
Connecting rod
(hole)

LDS 18
U-bracket
(both axles)

LDS 18
Start spring
(both ends)

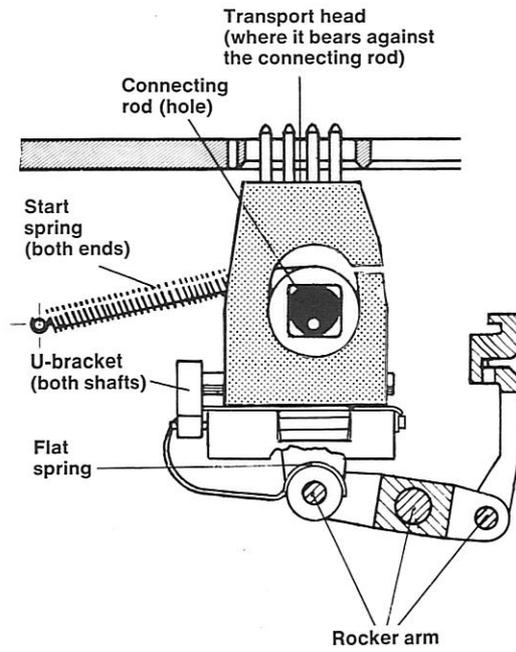
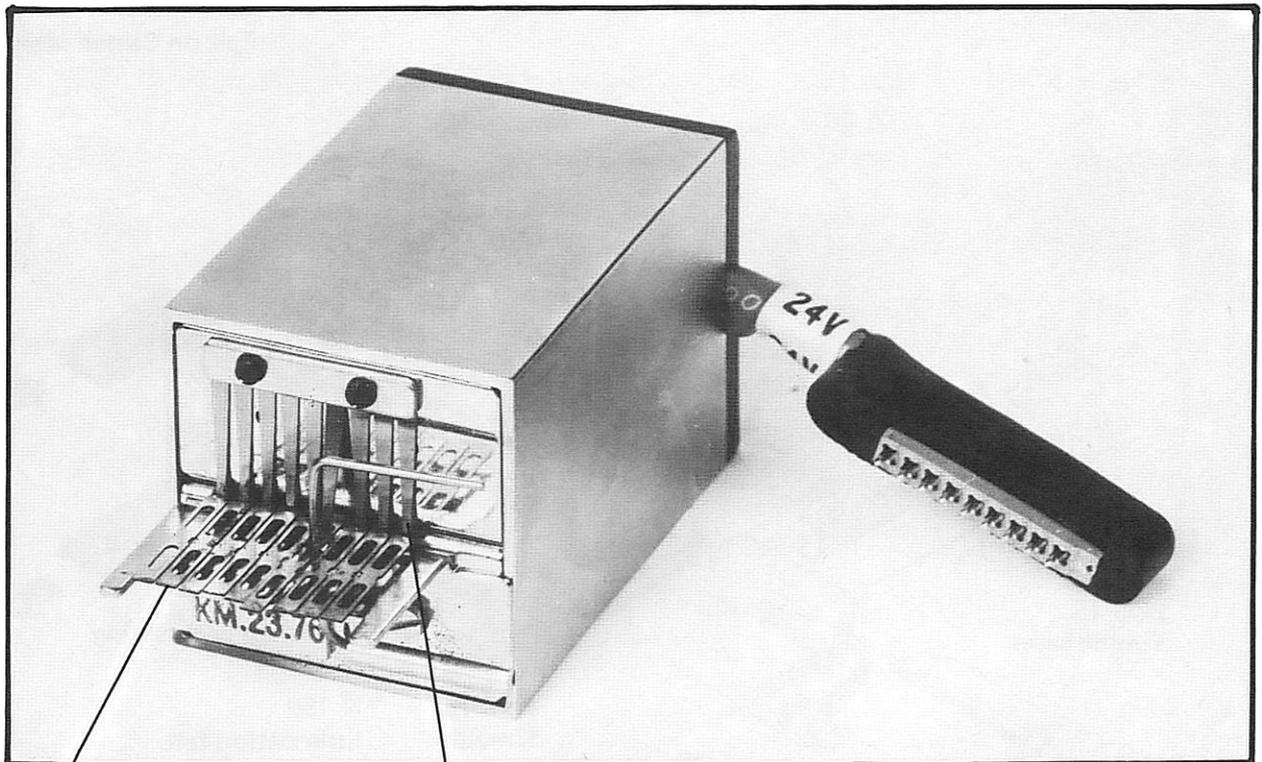


Fig. 6.4 Lubrication D (LDS 18)



Interposers (tips only)

Springs (tips only)

Fig. 6.5 Lubrication E (LDS 18)

K 150 Main shaft ball bearing

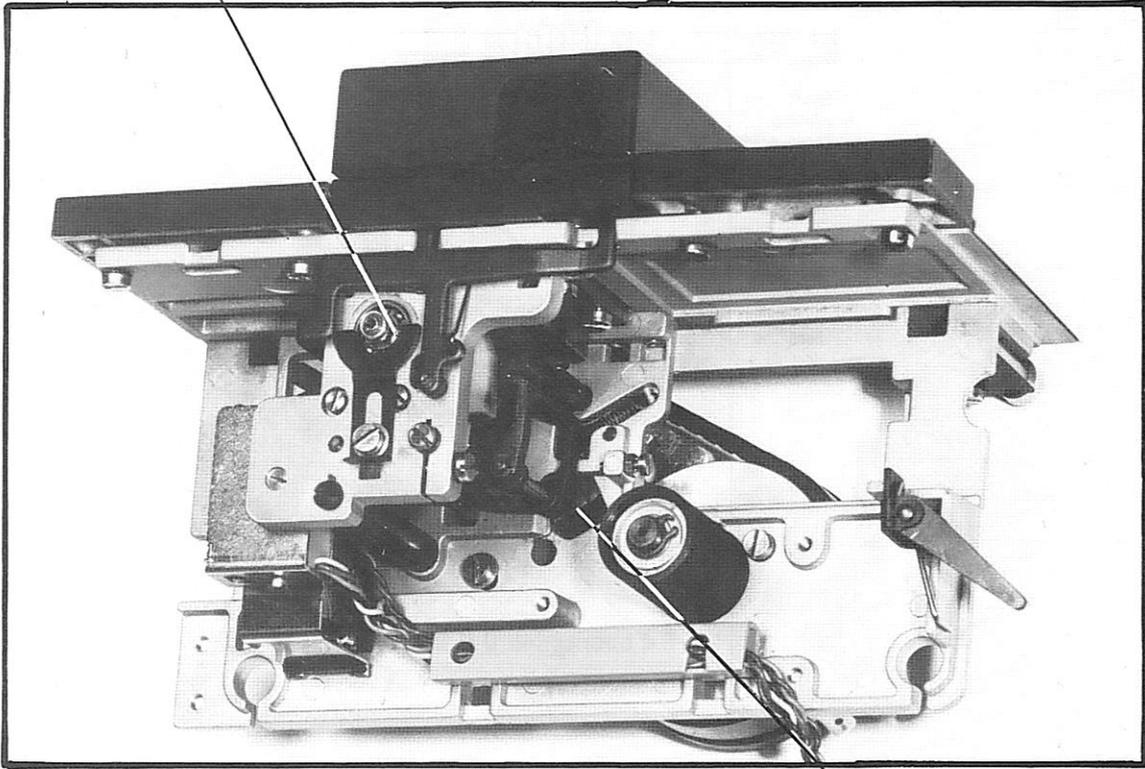
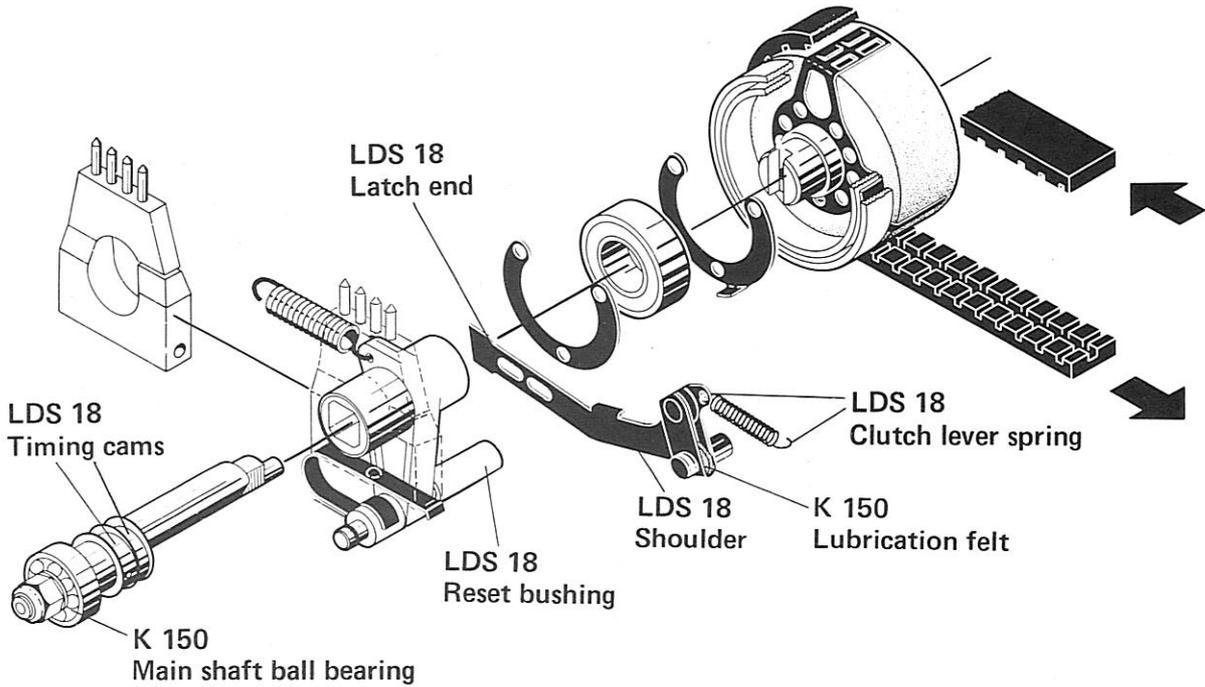


Fig. 6.6 Lubrication F

K 150
Felt on Clutch lever



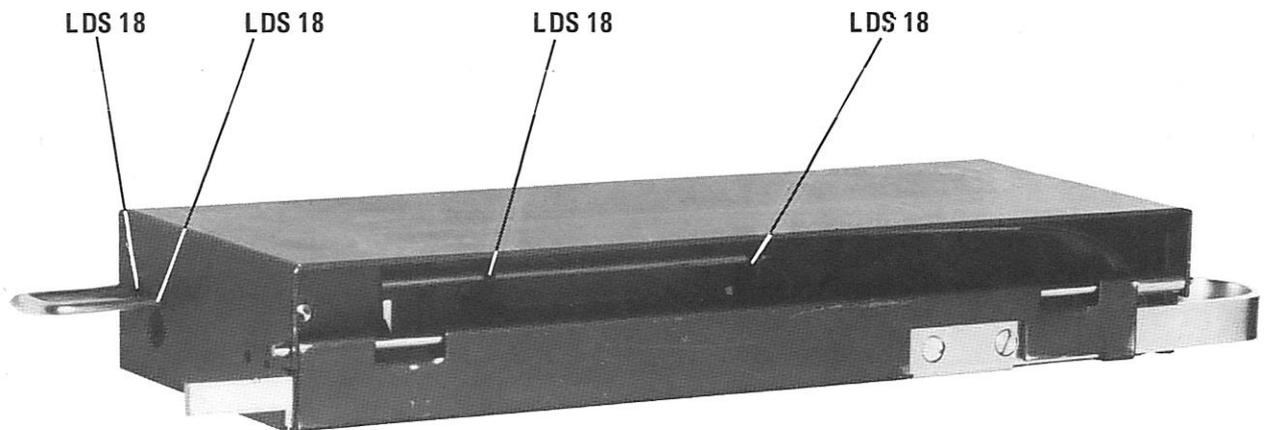


Fig. 6.8 Tape Guide Box

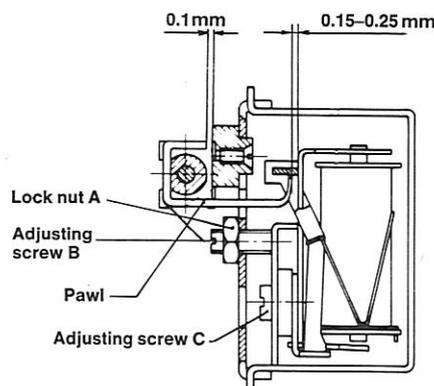
6.2 ADJUSTMENTS

Adjustment instructions for the punch unit are given in Sections 6.2.1 to 6.2.7. Note that in these sections "up and down" and "forwards and backwards" are defined as stated in Section 5.1.4.

The other parts of the punch station will not normally require readjustment. However, if misadjustment is suspected, it is obviously desirable to be able to carry out a check. Moreover, readjustment can be required after replacing certain (defective) parts, and if the punch station has been subjected to rough treatment. Hence full adjustment instructions are given in Sections 6.2.8 to 6.2.17.

6.2.1 Clutch Release Mechanism (Magnet and Bracket)

- a) Remove the clutch magnet and release mechanism (bracket) as described in Sections 6.3.15 and 6.3.22.
- b) Assemble the magnet and bracket, hooking the bottom end (opposite the pawl) first.
- c) Loosen screw C which holds the magnet, and insert an 0.1 mm flat feeler gauge between the pawl and the white plastic block (See Fig. 6.9). Slide the magnet down so that the feeler gauge is pinched. At the same time, be sure that the magnet is not tilted within its frame. Tighten the screw.
- d) Using a 5.5 mm socket, loosen lock-nut A, and turn adjusting screw B so that the pawl moves freely and a clearance of 0.15 - 0.25 mm exists between the tip of the pawl and the magnet's inner frame (See Fig. 6.9). Tighten the lock-nut and recheck the clearance.
- e) Unclip the magnet, top end (nearest the pawl) first.
- f) Ensure that the punch mechanism is turned so that the clutch lever is in its highest position (giving the greatest clearance for mounting the release mechanism).
- g) Carefully engage the pawl and clutch lever while sliding the unit into place.
- h) Mount the two fastening screws D (see Fig. 6.10), but do not tighten.
- i) Turn the punch mechanism until the pawl moves down, then clip the clutch magnet in place, bottom end (away from the pawl) first.
- j) Check that the clutch lever is still in its lowest position (pawl down).
- k) Slide the bracket and magnet unit up and down to achieve the two clearances shown in Fig. 6.11 (min. 0.15 between the pawl's elbow and the frame, min. 0.6 mm between the pawl's tip and the armature bridge while pressing the pawl towards the bridge). Tighten the 2 screws (D).
- l) Turn the punch to the stop position, and use a magnifying glass to be sure that the clutch lever is parallel to the face of the pawl. If this needs adjustment, the previous adjustment (k) must be rechecked.
- m) Check the operation by manually releasing the clutch and turning the punch through a complete cycle.



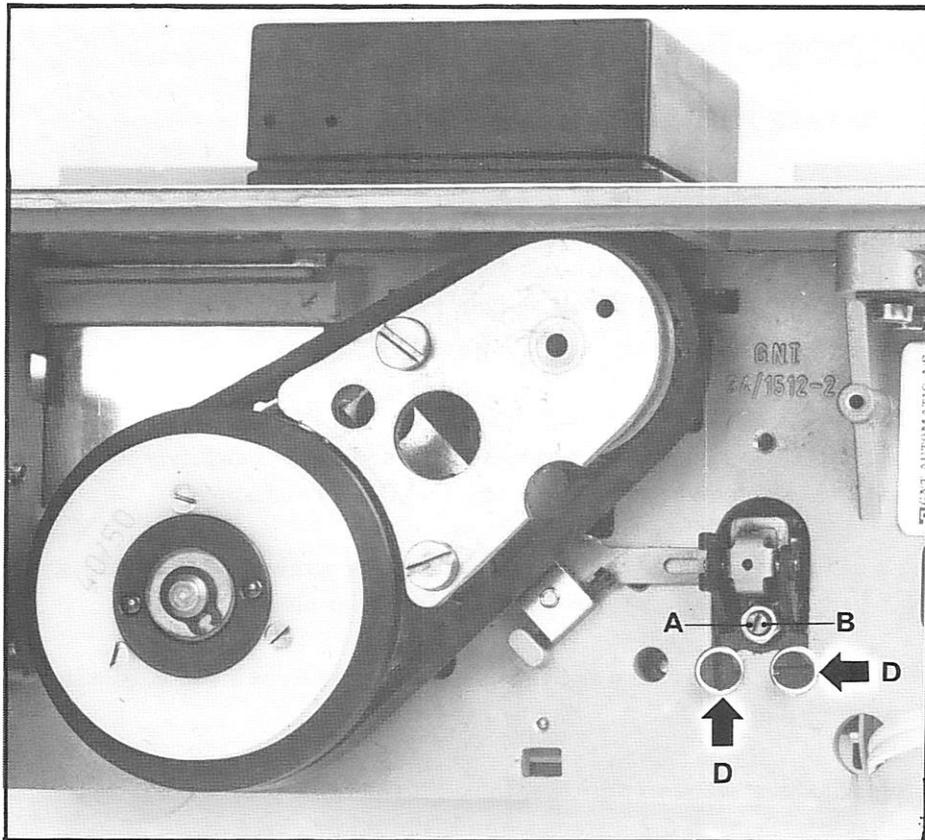


Fig. 6.10 Clutch Magnet, Adjusting Screw Locations

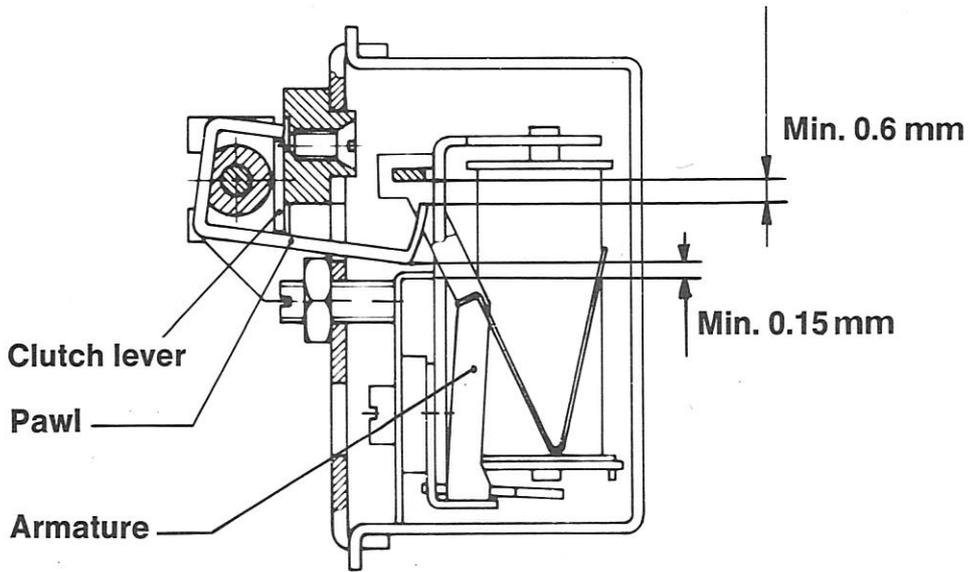
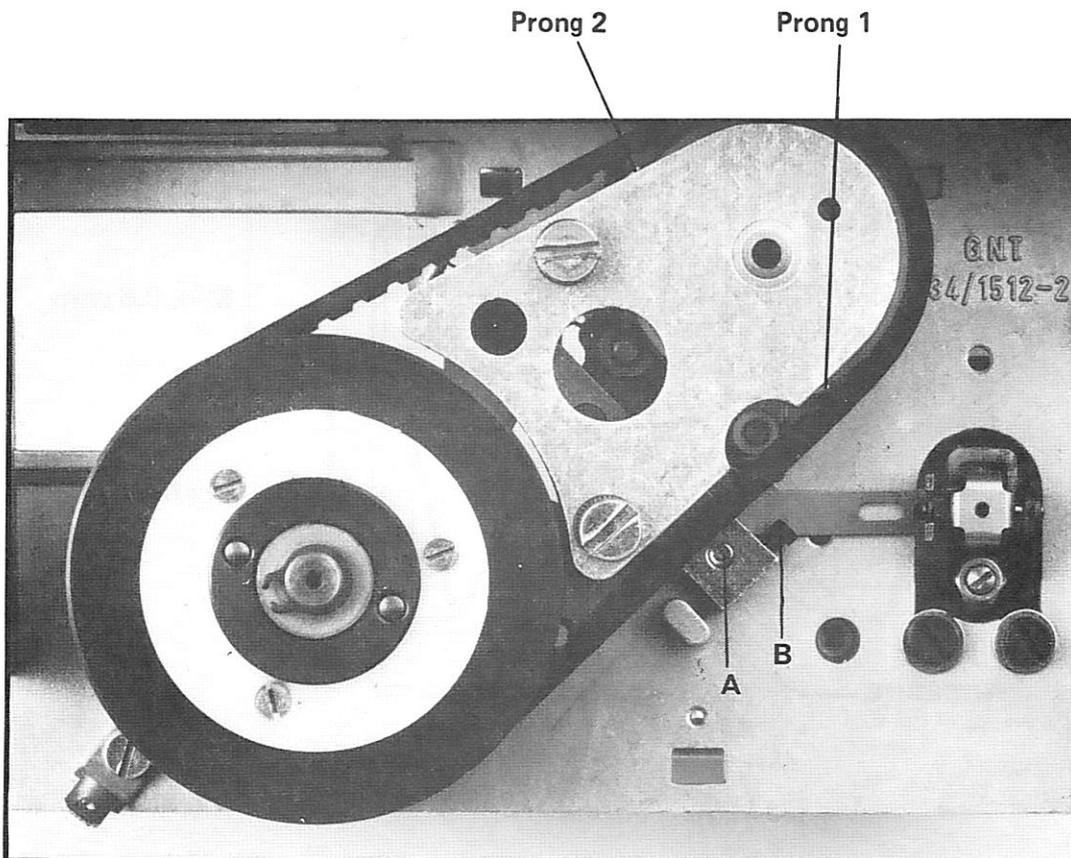


Fig. 6.11 Clutch Magnet Adjustment

6.2.2 Clutch Stop Position

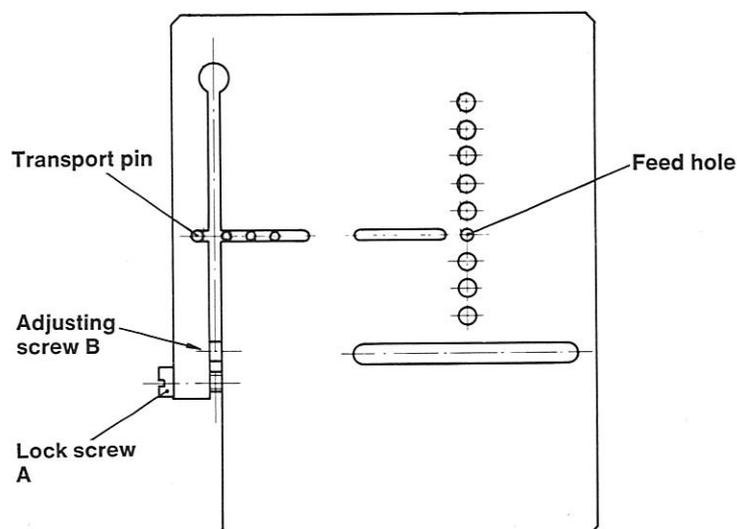
- a) Activate the TAPE FEED button for a few seconds.
- b) Remove the top cover as described in Section 6.3.1.
- c) Note the position of the prongs on the driven part (see Fig. 6.12). Neither prong should be in contact with the flat drive belt. Prong 1 should be somewhat closer to the belt than prong 2.
- d) If adjustment is necessary, remove the chad box, and separate the chassis and base (Section 6.3.29). Slacken locking screw A (by inserting a screwdriver in the hole) and release the clutch manually by pressing the magnet armature.
- e) If prong 2 had been touching the belt, turn adjusting screw B 1/2 turn clockwise. If prong 1 had been touching, turn B 1/2 turn counter clockwise.
- f) Retighten screw A, connect the signal cable and repeat steps a and c. Readjust if necessary (steps d and e).

N.B. After adjusting the stop position, the adjustment of the clutch release mechanism (Section 6.2.1 steps k and l) should be checked.



6.2.3 Tape Pitch Adjustment

- a) Arrange for the tape to emerge through the aperture in the front cover (see Section 3.7) and depress the tape feed button long enough to punch more than 50 feed holes in the tape.
- b) Tear off the tape, and with a pencil, mark the position of one feed hole. Then count 50 feed holes, not including the first, and make a second mark.
- c) Measure the distance from the 1st feed hole to the 51st (center-to-center). This distance should be $127.0 \text{ mm} \pm 0.6 \text{ mm}$. If it is not, proceed as follows:
- d) Dismantle according to Section 6.3.7.
- e) Snap off the chad chute, and remove the large single screw which holds the tape latch plate.
- f) Push the tape release arm out of engagement with the tape guide arm (see Fig. 5.6). Then remove the tape latch plate.
- g) Carefully inspect the slot for the 4 transport pins to be sure that an accumulation of dirt is not causing the change in tape pitch. If the slot is clogged, clean it, reassemble, and check the pitch again by following steps a, b, c. If dirt is not the cause of the incorrect pitch, proceed as follows:
- h) Remove the punch shield plate by loosening the 2 screws holding it and swinging it out and off.
- i) Unscrew the 2 screws which hold the left guide rail, and remove the guide rail.
- j) Loosen screw A (See Fig. 6.13), and adjust screw B using a 0.8 mm Allen wrench. Turning screw B 1/2 turn clockwise will increase the 50-hole pitch by about 0.5 mm. Turning screw B 1/2 turn counter clockwise will decrease the 50-hole pitch by about 0.5 mm. Retighten screw A.
- h) Reassemble, and check by following instructions a, b, and c. You may, however, find it more convenient to punch the 50 holes by turning the punch by hand.



6.13 Tape Pitch Adjustment

6.2.4 U-Bracket Adjustment

To obtain correct engagement between the feed pins and the tape holes, the U-bracket must be correctly set.

- a) Dismantle according to Section 6.3.7.
- b) Snap off the chad chute, and remove the tape latch. (See Section 6.2.3, steps e, f).
- c) Remove the Y-clamp which holds the main shaft ball bearing.
- d) Insert a piece of correctly punched tape (only feed holes necessary).
- e) Manually release the clutch, and turn the flat belt so that the feed pins retract, move back, and are just about to rise again.
- f) If the feed pins do not correctly engage the feed holes, loosen the 2 screws marked A, and adjust screw B (inside the chassis). (See Figs. 6.14 and 6.15).
- g) Turning screw B clockwise moves the feed pins forwards, while turning it counter clockwise moves them backwards. A half turn moves the pins approximately 1/2 the distance across a feed hole.
- h) Turn the mechanism to the stop position, and manually release the clutch. Turn the mechanism until the pins strike the die block and begin to retract. At this point the pins should press against the die block with a force of 200 - 500 g. If not, screw B must be readjusted until the criteria of both step f and h are met.
- i) A fine adjustment of the tape pitch (Section 6.2.3) may be necessary after adjusting the U-bracket.

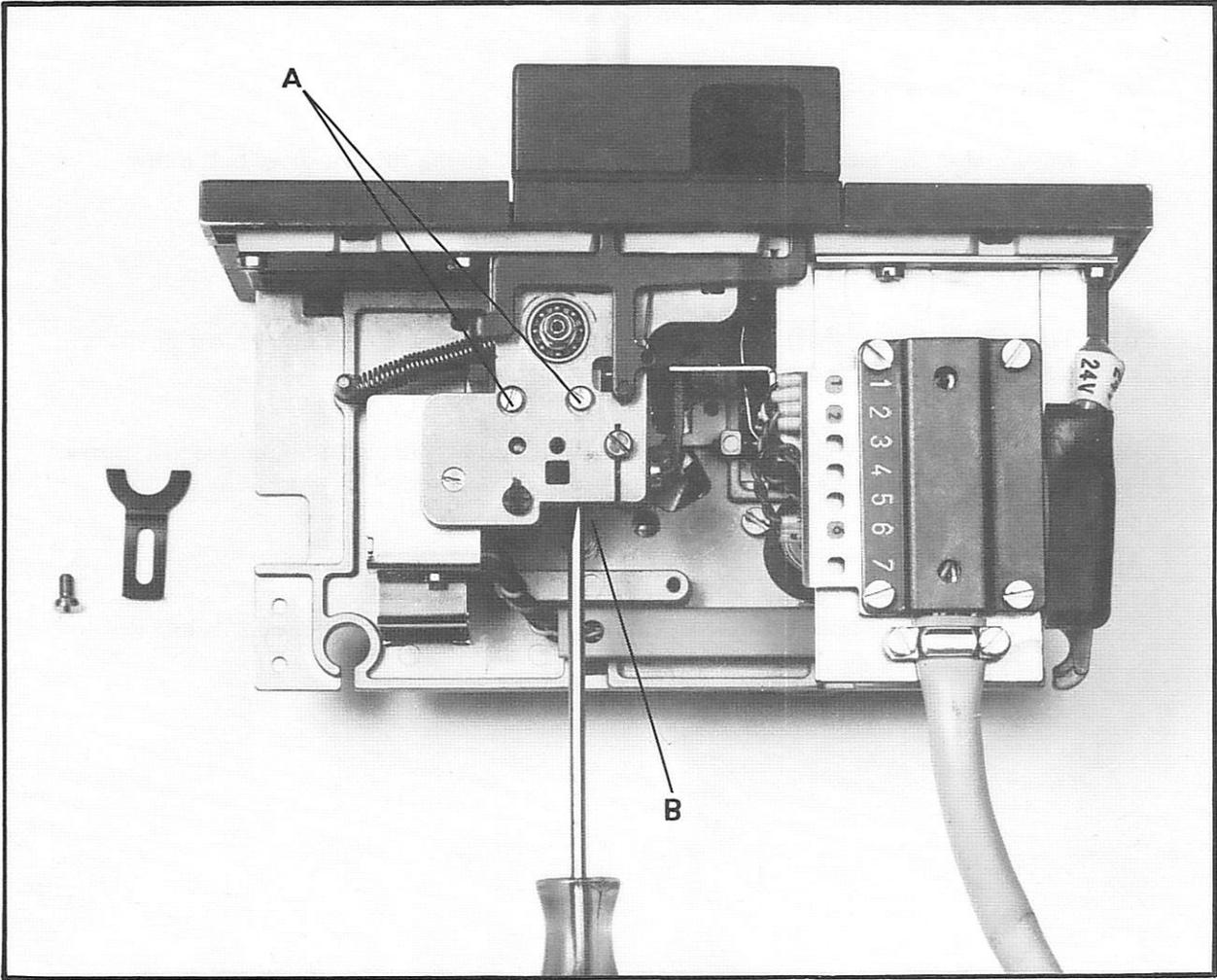


Fig. 6.14 U-bracket Adjustment

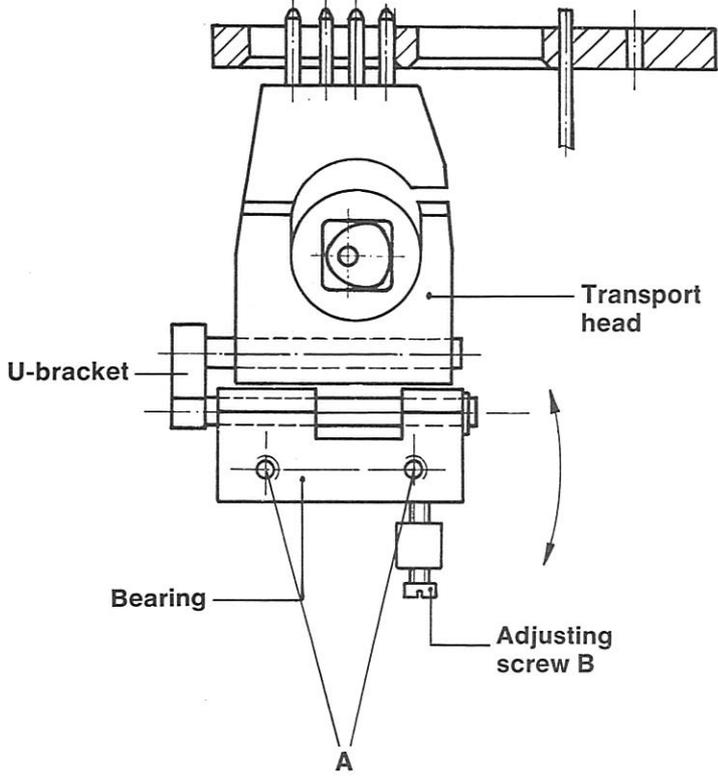
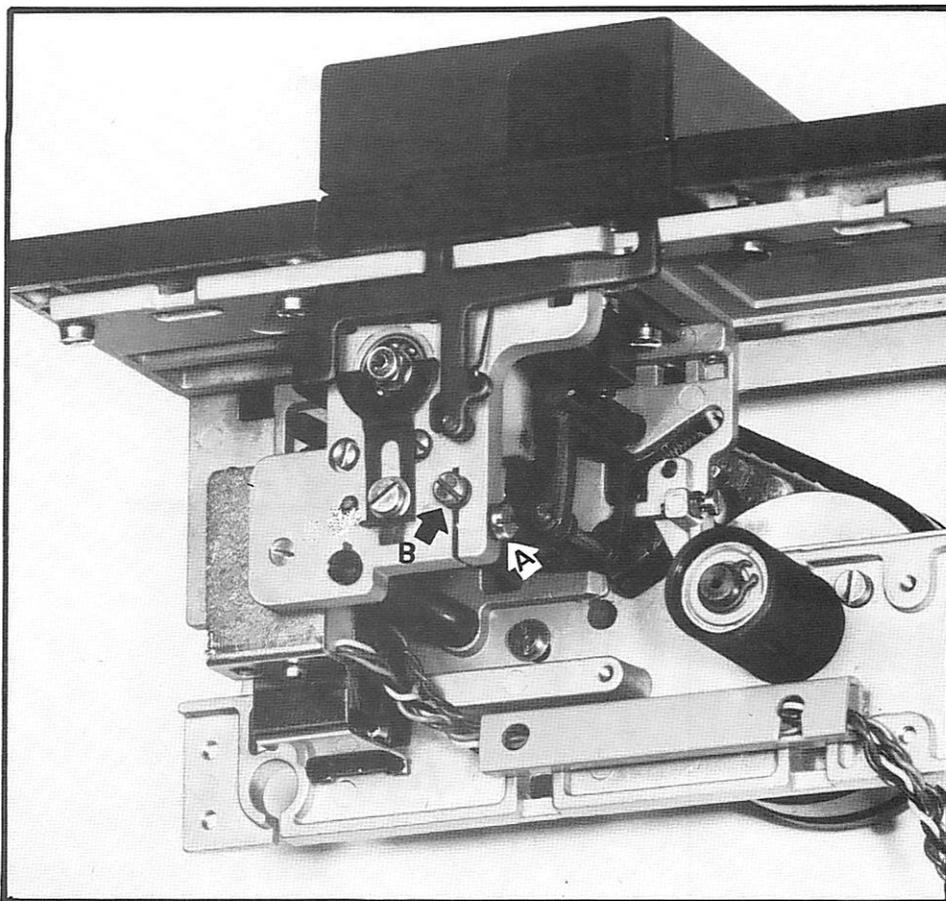


Fig. 6.15 U-bracket Diagram

6.2.5 Punch Bridge Height (Rocker Arm Eccentric Shaft)

- a) Remove the selector box (Section 6.3.12).
- b) Ensure that the punch is in the stop position by giving the flat drive belt a few turns.
- c) Loosen locking screw A. (See Fig. 6.16).
- d) Turn the eccentric shaft B so that the punching bridge is in its uppermost position (the slot in the shaft vertical).
- e) Then turn B slowly clockwise until the lower end of the punching knives just clears the slot for the interposers.
- f) Tighten locking screw A.

N.B.: If the chad are not cleanly cut, this adjustment can be "fine tuned" while the punch is running.



6.2.6 Checking and Positioning the Selector Box

Incorrect punching may be caused by incorrect positioning of the selector box, but before attempting any adjustment, check the operation of the box as follows:

- a) Remove the selector box as described in Section 6.3.12.
- b) Examine the interposer blades to be sure that they are all in line within 0.3 mm (not including the feed-hole interposer).
- c) Short pins 1 - 8 together on the selector box plug, and apply 24 V across pins 1 - 8 and pin 9 (Pin 9 is the one nearest the box). All interposer blades should move forward about 1 mm and still be in line, ± 0.3 mm. If the selector box does not satisfy the criteria listed here under b and c, it must be replaced and a factory overhaul of the faulty unit carried out.

IMPORTANT: To avoid burning out the selector box, the 24 V must not be applied for longer than 3 minutes. Alternatively, 18 V can be applied indefinitely.

- d) If the selector box is in order, adjust its position as follows:
 - e) Replace the selector box in the punch mechanism.
 - f) Release the clutch manually, and rotate the mechanism slightly so that the punch knives can be seen in the slot in the punching bridge.
 - g) Insert an 0.25 mm round (wire type) feeler gauge into the slot (between the knives and the interposers). Be sure that the gauge goes all the way into the slot.
- N.B. The feed hole interposer must be manually disengaged using the lever.
- h) If the gauge does not go in or is too loose, remove the selector box and change its position slightly by loosening lock nut A and adjusting screw B (Fig. 6.17).
 - i) Re-insert the selector box and repeat the measurement. When the clearance is satisfactory, tighten lock nut A.

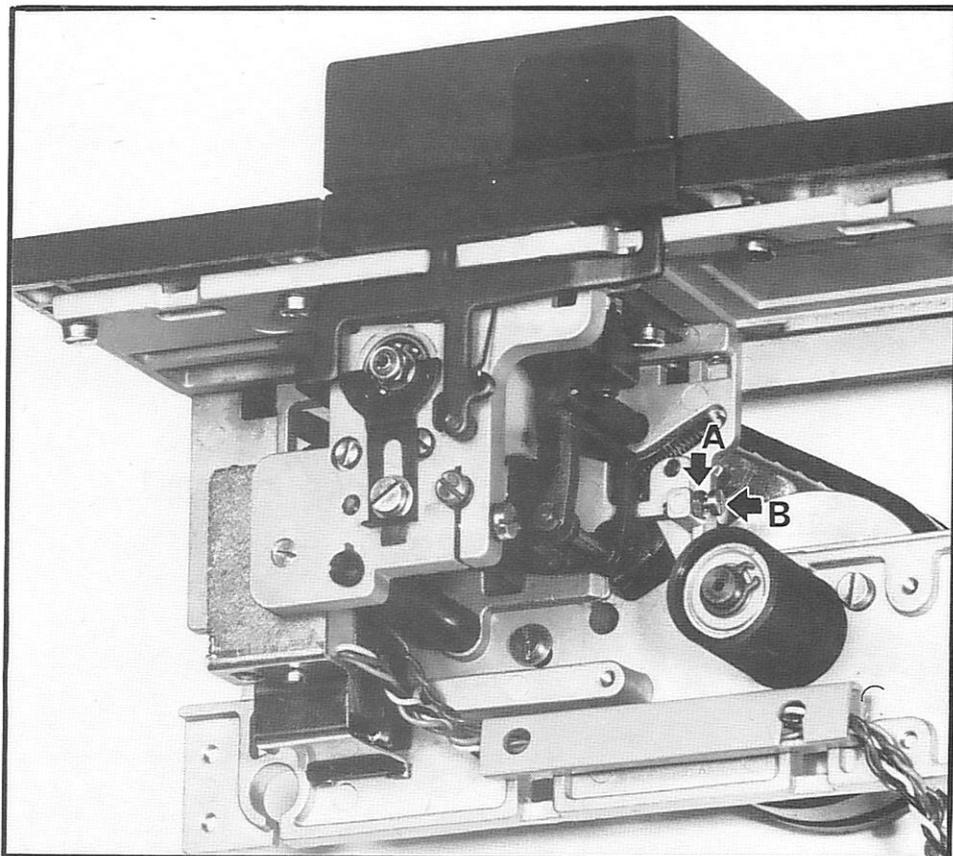


Fig. 6.17 Selector Box Positioning

6.2.7 Timing Cam Adjustment

MECHANICAL

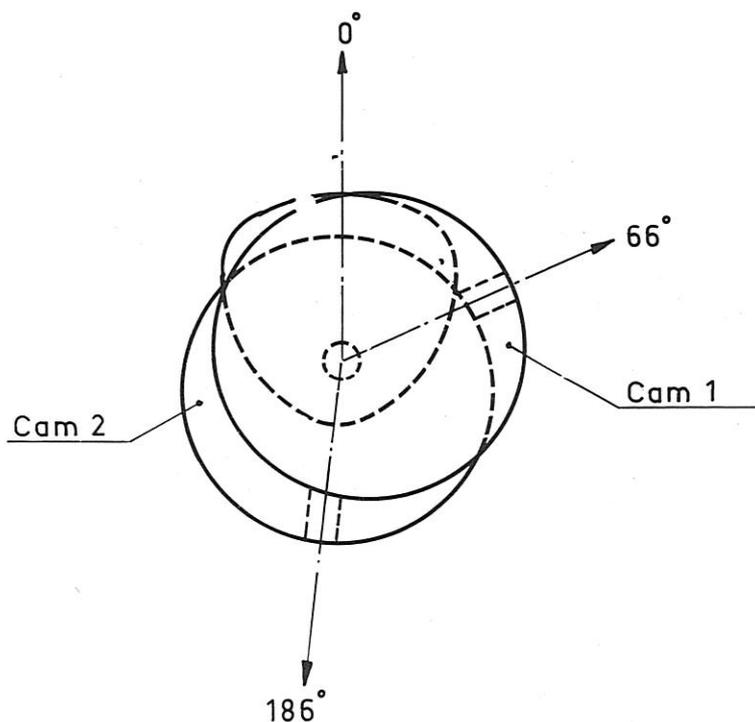
- a) Remove the main shaft as described in Section 6.3.14.
- b) Clamp the shaft vertically in a vice with the three-lobed carrier positioned as shown in Fig. 6.18. The GNT "tool for cam setting", 34/3051, can be used to hold the shaft instead of a vice.
- c) Loosen the hex nut at the end of the shaft. The 2 cams are now free to turn. As an aid to adjustment, it is a good idea to insert short pieces of stiff wire (paper clips have about the right diameter) into the holes in the cam faces. These holes indicate the cam peaks.
- d) The GNT 3406 is designed to operate with the following cam settings:

Cam Contact 1: makes at 40°
 breaks at 210°

Cam Contact 2: makes at 160°
 breaks at 330°

To achieve these settings, proceed as follows:

- e) Using the stiff wires, set cam 1 to 66° and cam 2 to 186° .
- f) Tighten the lock nut while holding the wire in cam 1 to prevent the cams from turning.
- g) Re-insert the main shaft as described in Section 6.3.14.



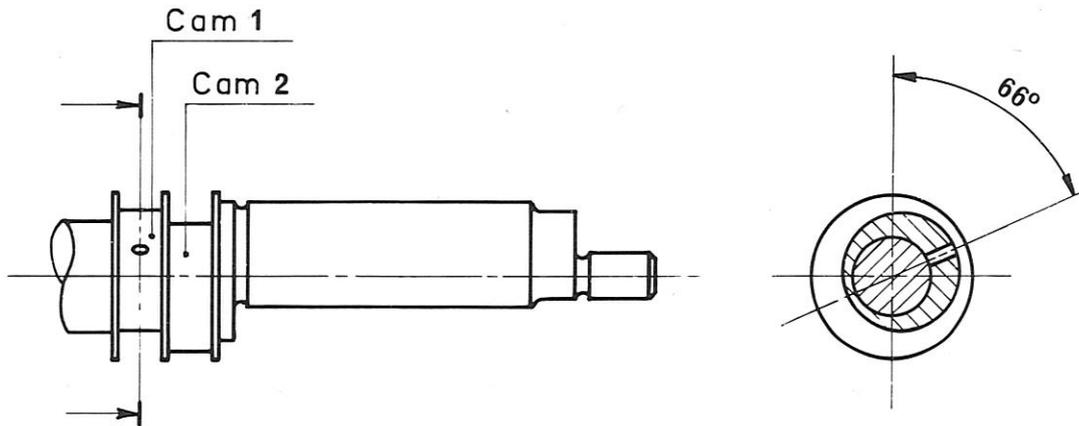


Fig. 6.18b Timing Cam Adjustment

ELECTRICAL

The exact make and break points are set by adjusting the contact screws. (See Fig. 5.7).

- h) Unplug plug no. 1 and plug no. 2 from the patch board.
- i) Connect an ohmmeter across the pins of plug 1.
- j) Be sure that the punch is in the stop position.
- k) Press the graduated plastic disc, tool No. 34/3053 onto the hex nut on the end of the main shaft. In lieu of this, mark the shaft with a pencil. Carefully note the zero position.
- l) Release the clutch manually, and slowly rotate the mechanism using the flat drive belt. Note at which point the contact closes (the ohmmeter goes to zero) and at which point it opens again.
- m) If necessary, use a jeweler's screwdriver to change the on/off ratio (see Fig. 5.7 for the location of the appropriate adjusting screw). Turning the screw clockwise increases the on/off ratio, i. e. the contact will close sooner and open later.
- n) Repeat the procedure for contact 2.

6.2.8 Forward Position of Tension Arm

The tension arm should reach the forward end of its slot when the tape load arm reaches the far right position (i. e. is at 90° to the front plate, as determined by the stop built into the tape load arm). To adjust this mechanism, first remove the control panel unit (see Section 6.3.36), then loosen the screw in the middle of the disc below the tape load arm, rotate the disc and retighten the screw, see Fig. 6.19. Now replace the control panel unit.

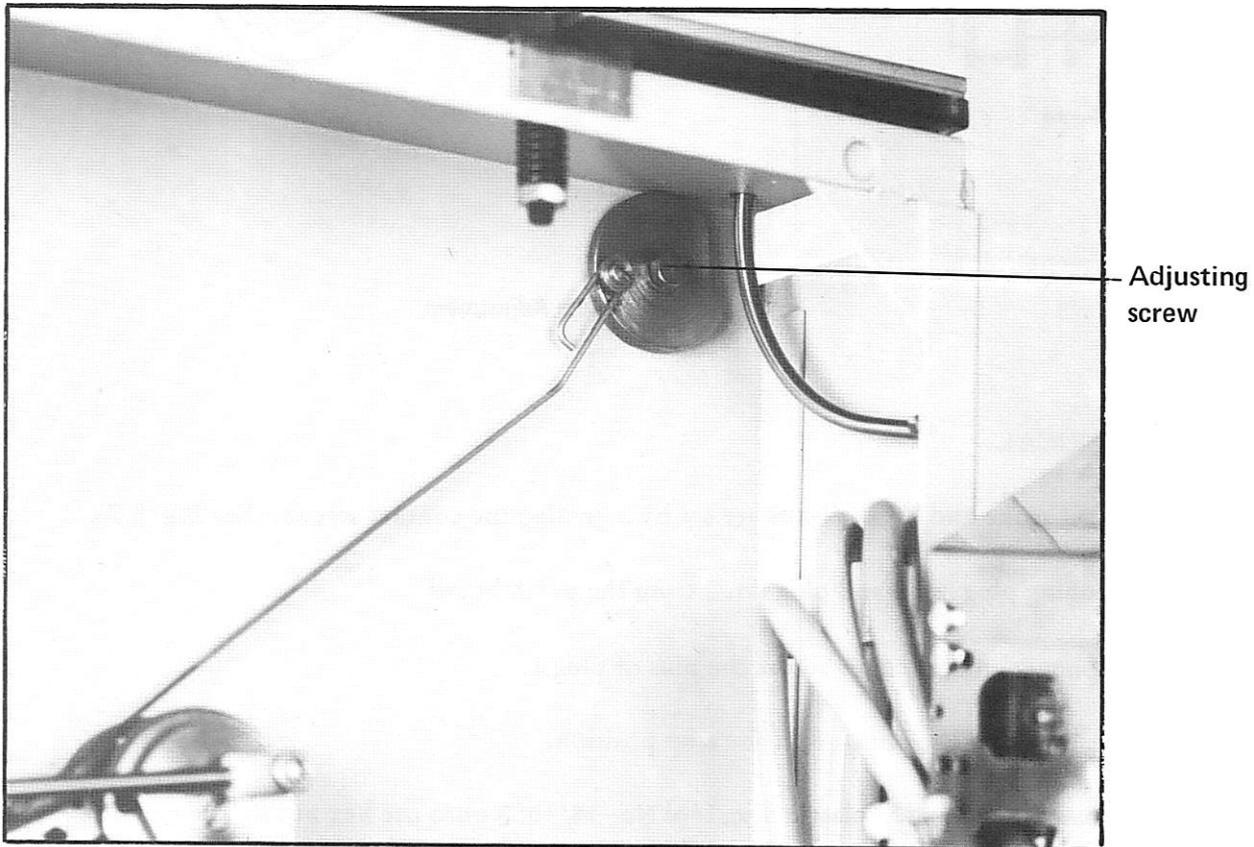


Fig.6.19 Adjusting Forward Position of Tension Arm

6.2.9 Brake Application

Application of the brake should occur when the tension arm roller is 4 to 6 mm in front of the slotted plate, see Fig. 6.20. The application point can be adjusted by means of the screw on the tension arm unit, See Fig. 6.21.

6.2.10 Tape-Low

Operation of the tape-low micro-switch should occur when there are about 5 m of tape left on the core. Adjustment is carried out by loosening screw A and rotating the cam, see Fig. 6.21. Retighten the screw, making sure that the cam has 0.1 to 0.2 mm (0.004" to 0.008") of vertical play.

6.2.11 Tape-Out

Operation of the tape-out micro-switch should occur when the tension arm roller is at the slotted plate, see Fig. 6.22. Adjustment is carried out by means of nut A, see Fig. 6.21.

6.2.12 Taut-Tape

Operation of the tape-error micro-switch should occur when the tension arm roller is 2 to 5 mm behind the front cover plate of the punch, see Fig. 6.23. Adjustment is carried out by means of nut B on the function rod, see Fig. 6.21.

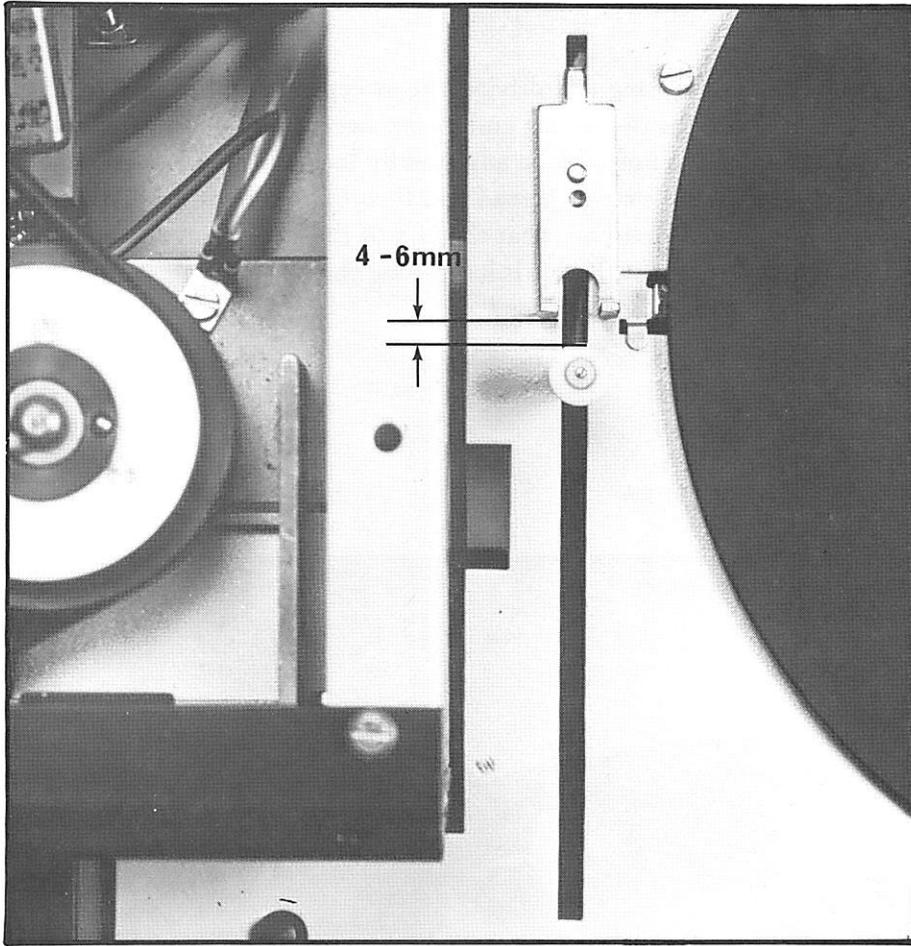


Fig. 6.20 Brake Operating Point

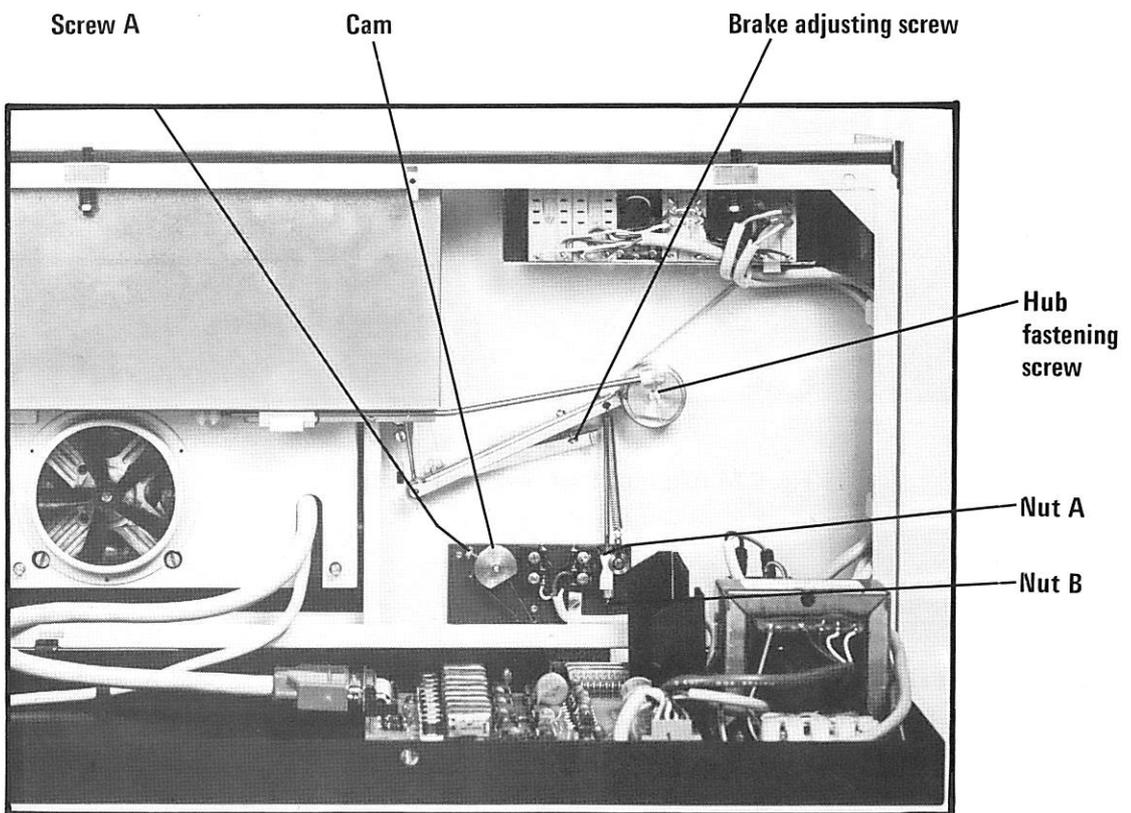


Fig. 6.21 Chassis, seen from below

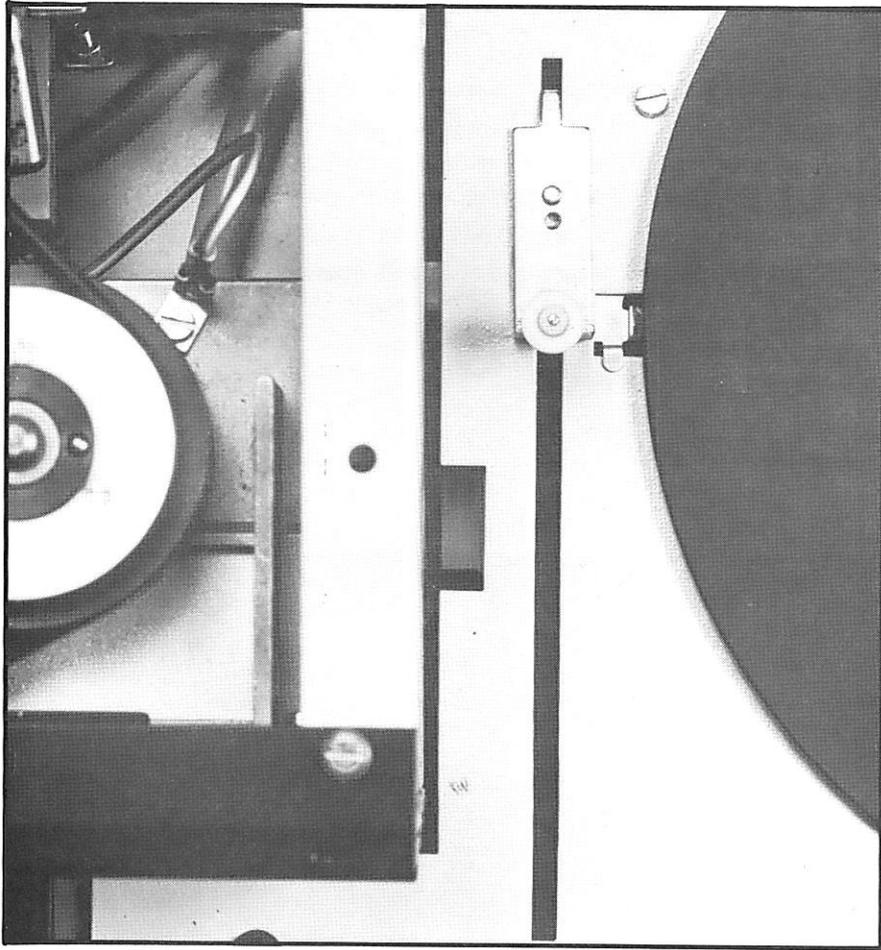


Fig. 6.22 Tape Out Indication Point

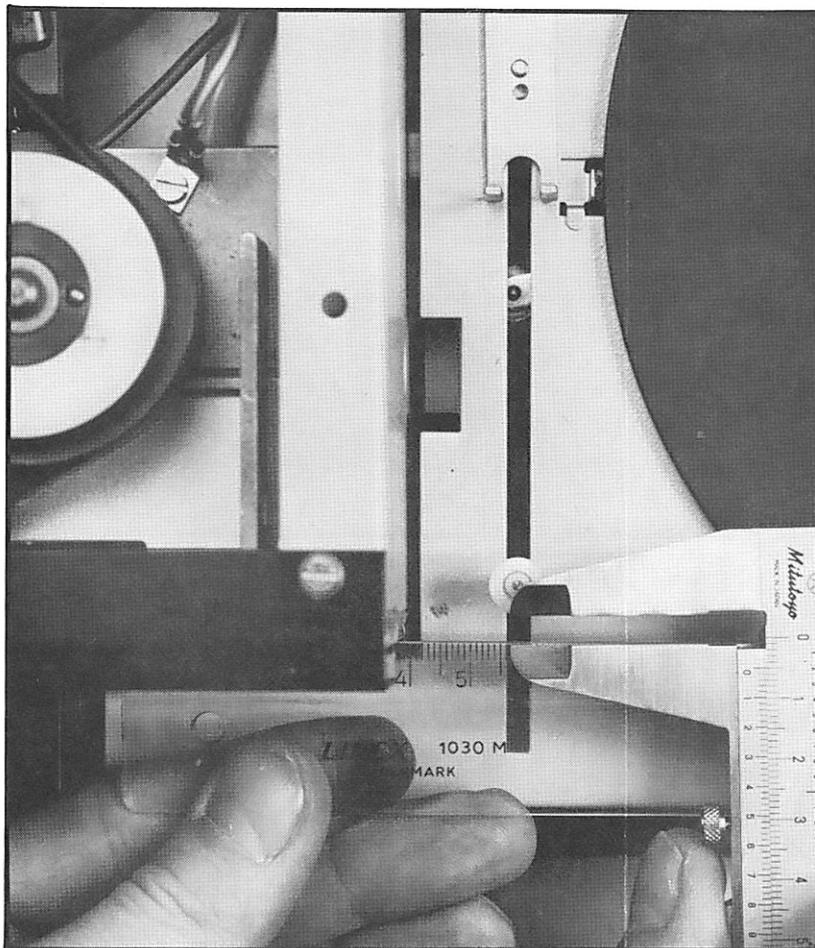


Fig. 6.23 Taut Tape Indication Point

6.2.13 Chad Sweeper Function

The boss on the end of the connecting rod driving the sweeper must be capable of engaging with the sweeper when the projecting end of the sweeper is up against either end of the slot. The position of the boss can be adjusted by loosening the Allen screw in the end of the boss, rotating the boss on its thread and then tightening the Allen screw, see Fig. 6.24. Check, by rotating the lower disc, that the end of the sweeper is not being forced up against either end of the slot. If this is happening the boss setting should be slightly readjusted.

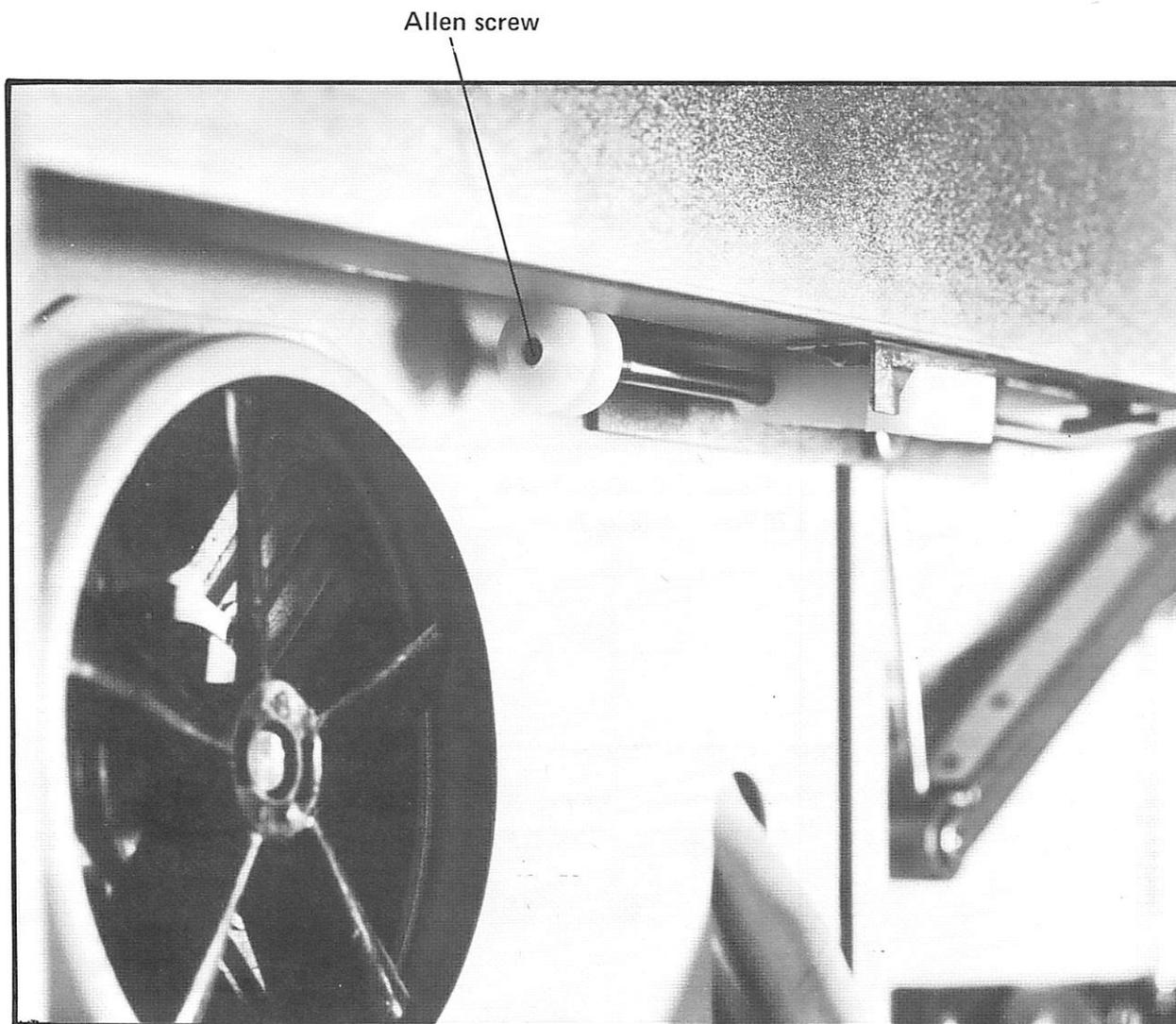


Fig. 6.24 Adjusting Chad Sweeper Function

6.2.14 Tape Guide Box Position

The position of the tape guide box in the forward-backward direction should be such that the tape enters the visor track along the top of the punch unit as shown in Fig. 6.25., i. e. the tape must enter in the middle of the track, or strike the face of the visor. Adjustment is carried out by means of screws A, see Fig. 6.26.

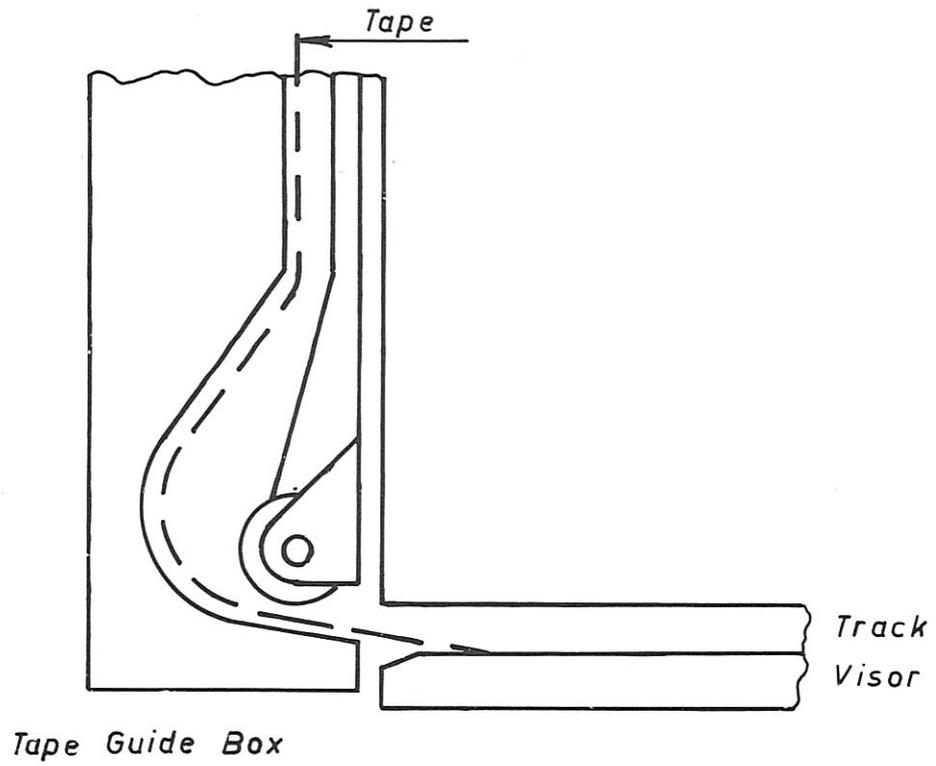


Fig. 6.25 Correct tape Tracking

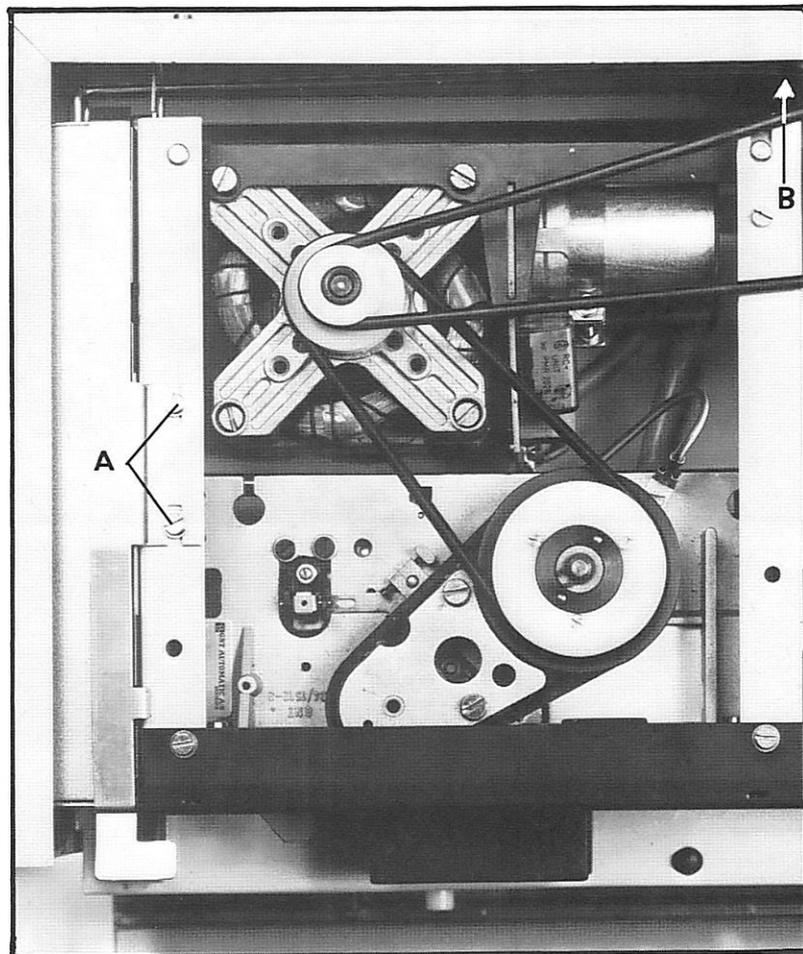
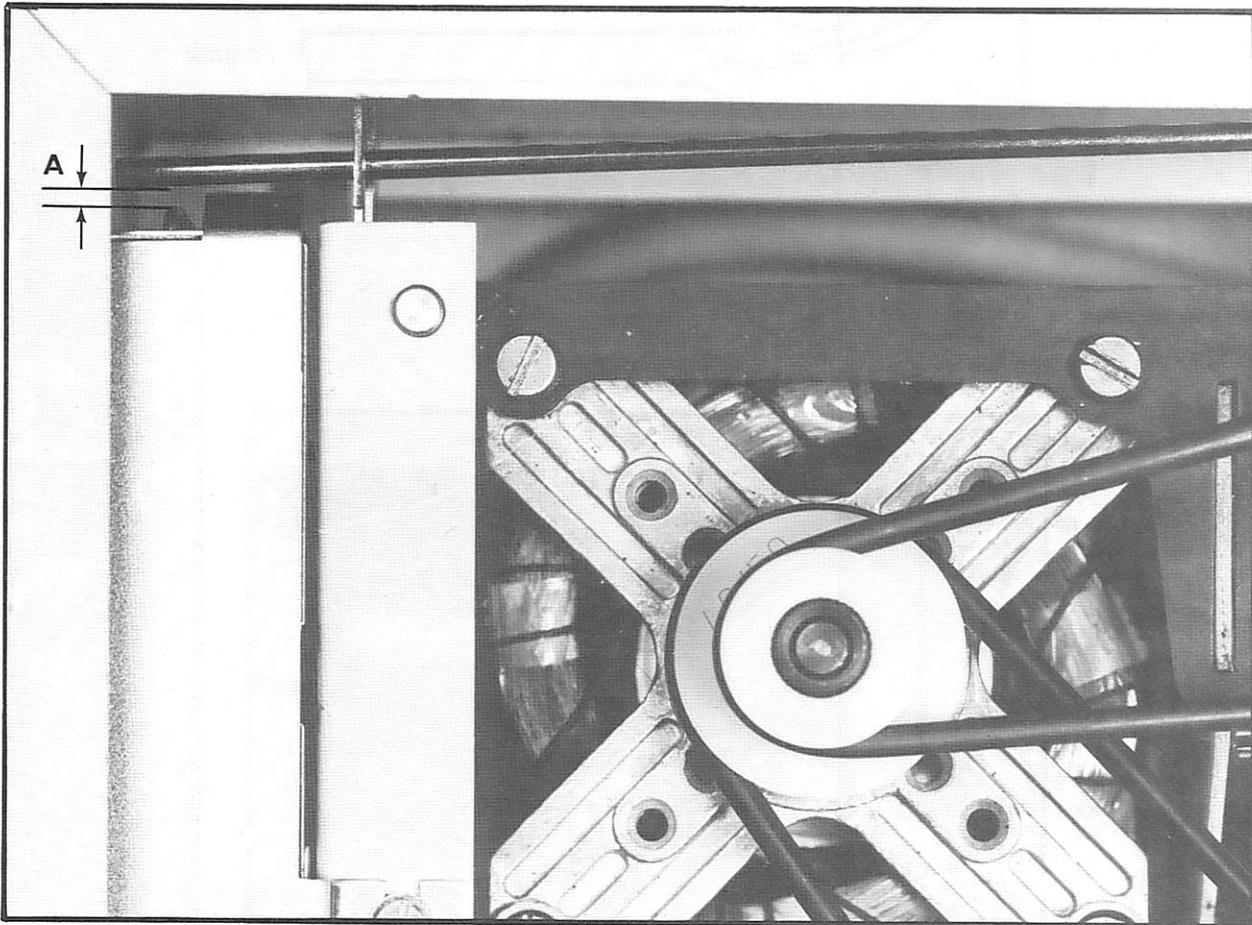


Fig. 6.26 Adjusting Tape Tracking

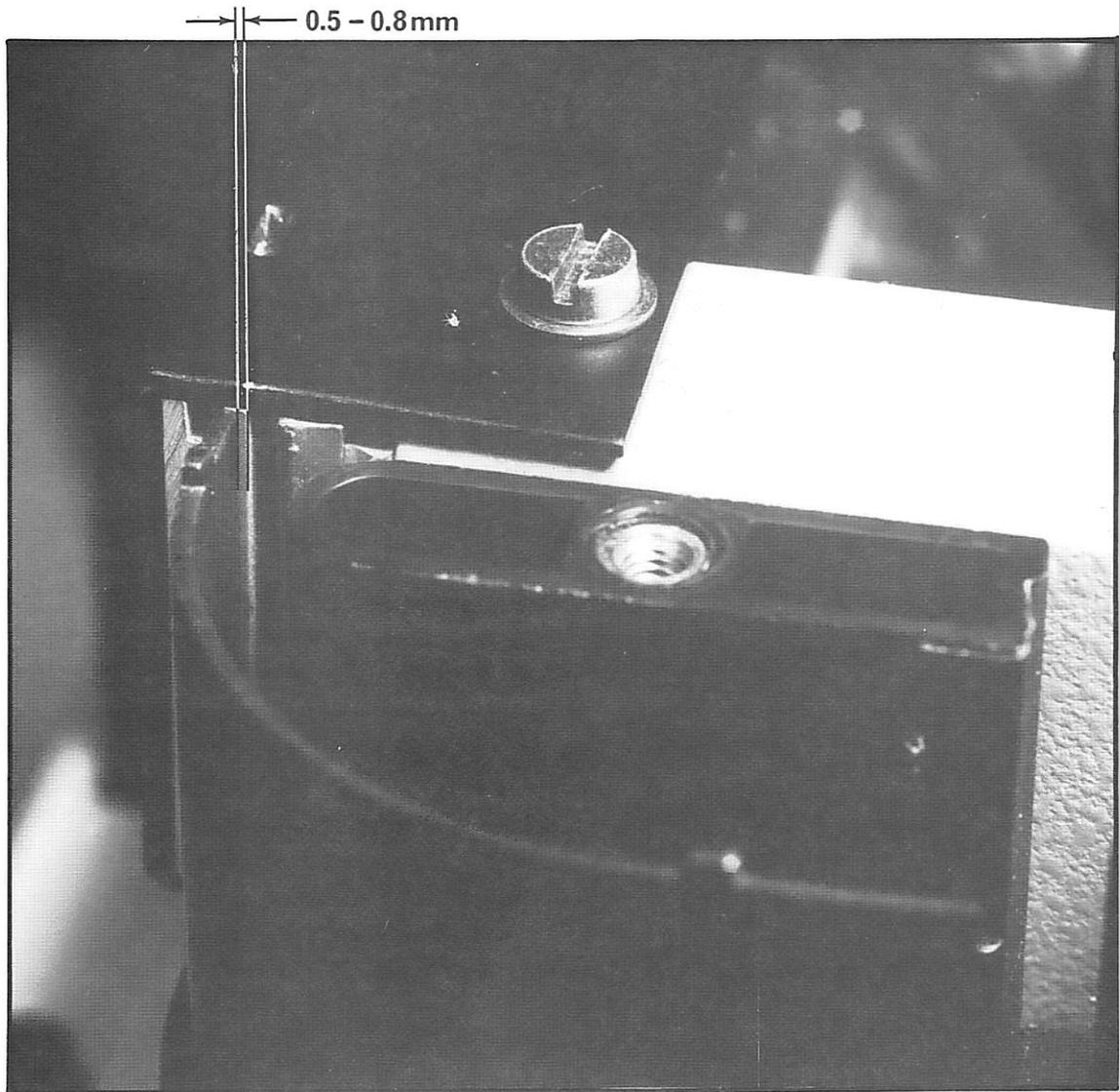
6.2.15 Interconnecting Arm Action

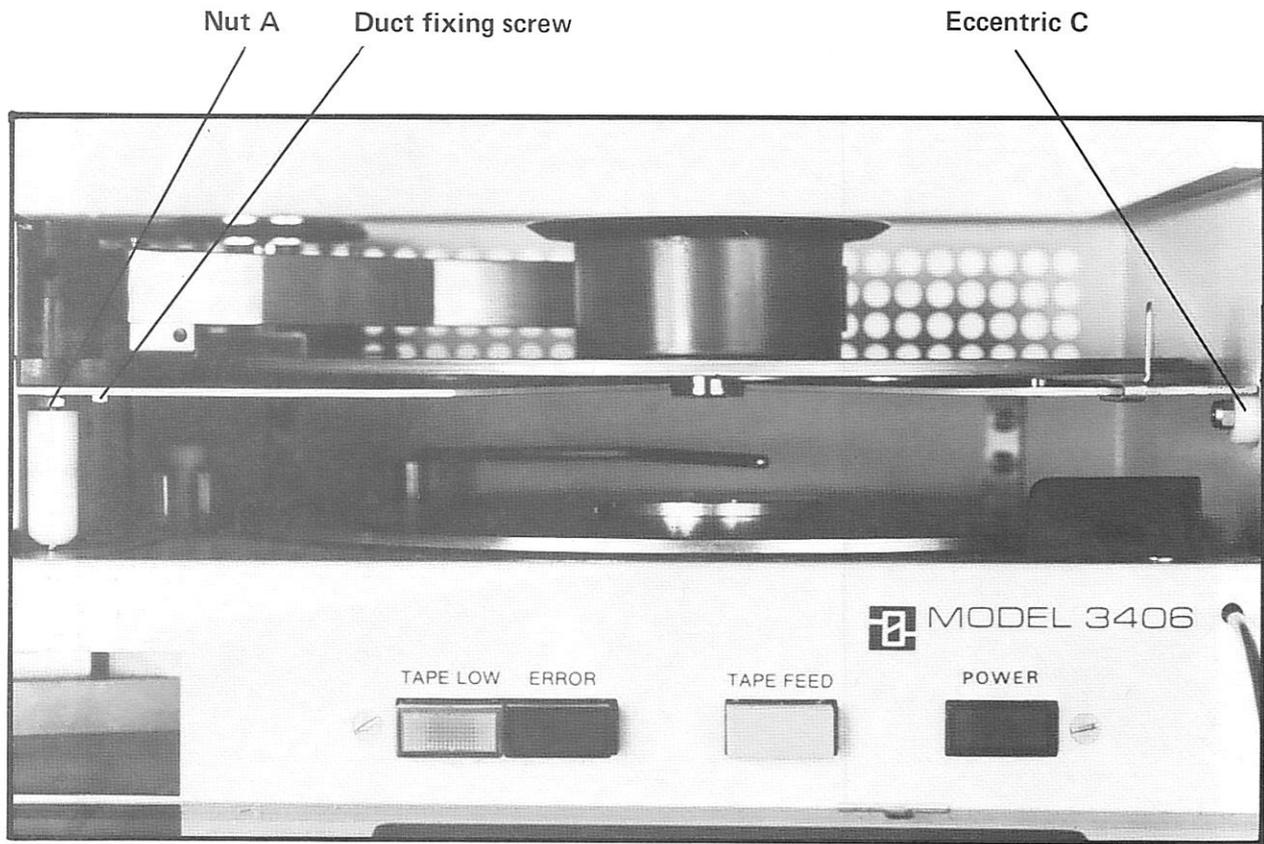
When distance A, see Fig. 6.27, is 2 mm the upper disc must not rotate, but rotation must occur when A is 4 mm. Note that A refers to the position of the end of the roller unit when it bottoms in the forward direction. In order to check the adjustment, remove the drive belt to the capstan pulley, push the roller unit forward until it bottoms, and hold the interconnecting arm 2 mm from the end of the roller unit. Rotate the upper disc and check that the capstan pulley does not rotate. Now hold the interconnecting arm 4 mm from the end of the roller, rotate the upper disc and check that the capstan pulley rotates. Adjustment is carried out by carefully bending the interconnecting arm at point B. (see Fig. 6.26)



6.2.16 Track-Duct Displacement

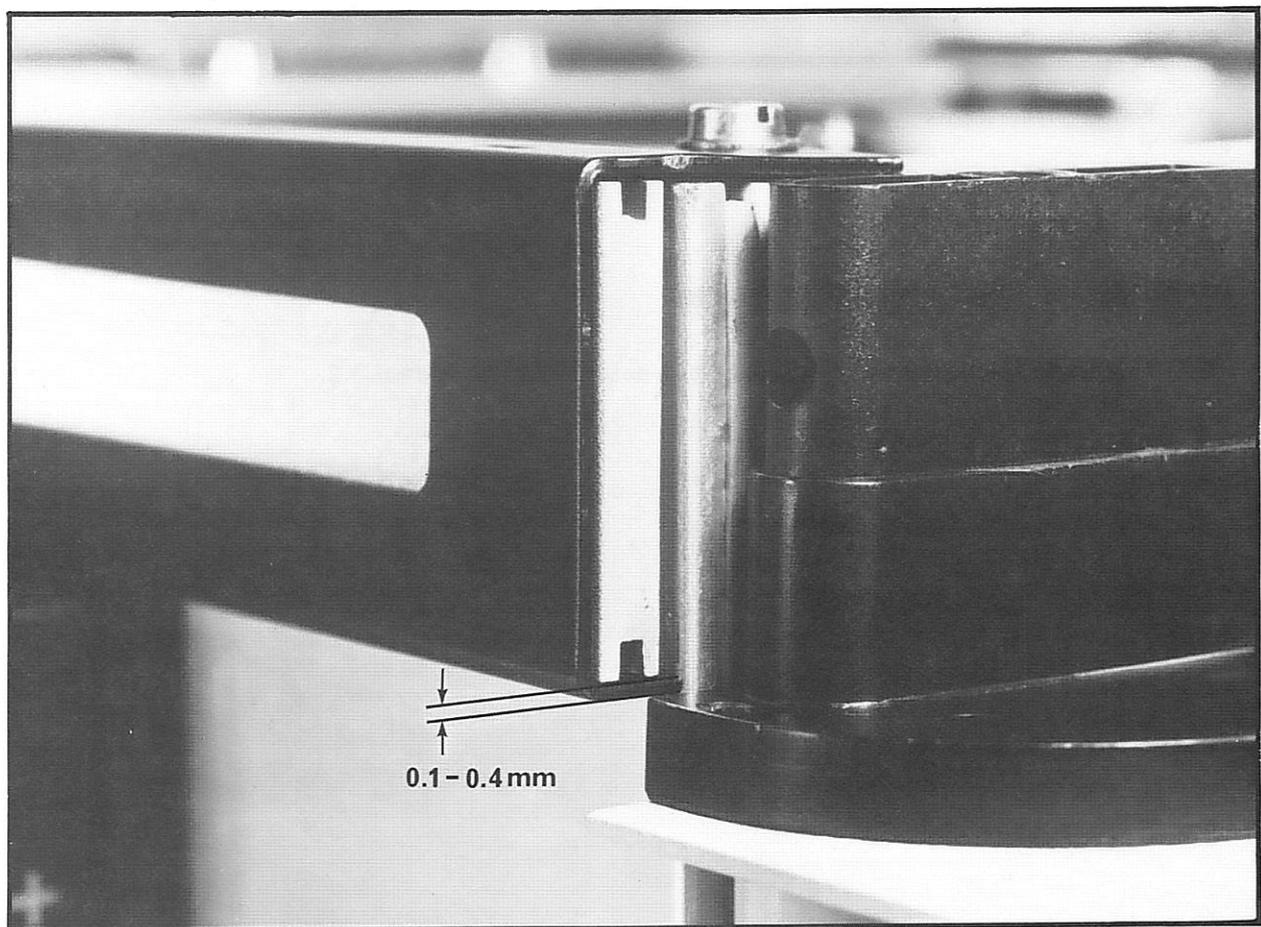
For proper operation the inside of the left edge of the duct should be 0.5 to 0.8 mm in front of the corresponding edge of the track, see Fig. 6.28a. The top of the tape duct should be removed in order to check this setting. Adjustment is carried out by loosening the duct fixing screw and nut A, which is reached by pulling down the roller (see Fig. 6.28b) and moving the duct to the correct position. The fixing screw should then be tightened. Now check the adjustment described in 6.2.17, and ensure that this is correct before retightening nut A.





6.2.17 Track-Duct Step

It is essential that the bottom edge of the visor track along the top of the punch is not below the corresponding edge of the tape duct, see Fig. 6.29. Otherwise the tape will tend to jam against the bottom edge of the tape duct. The correct setting is for the bottom of the tape duct to be 0.1 to 0.4 mm below the bottom of the track. The top of the tape duct should be removed in order to check this setting. Adjustment is carried out by screwing the intermediate plate support up or down (remember to loosen and retighten nut A, which is reached by pulling down the roller) and correspondingly adjusting eccentric C. (Fig. 6.28b).



6.3 DISMANTLING

N.B. Disconnect both power and interface cables before starting any dismantling work.

Having removed sub-assemblies as described in the following, they can be replaced by reversing these dismantling procedures. Special notes concerning reassembly are included where necessary.

6.3.1 Removing Top Cover

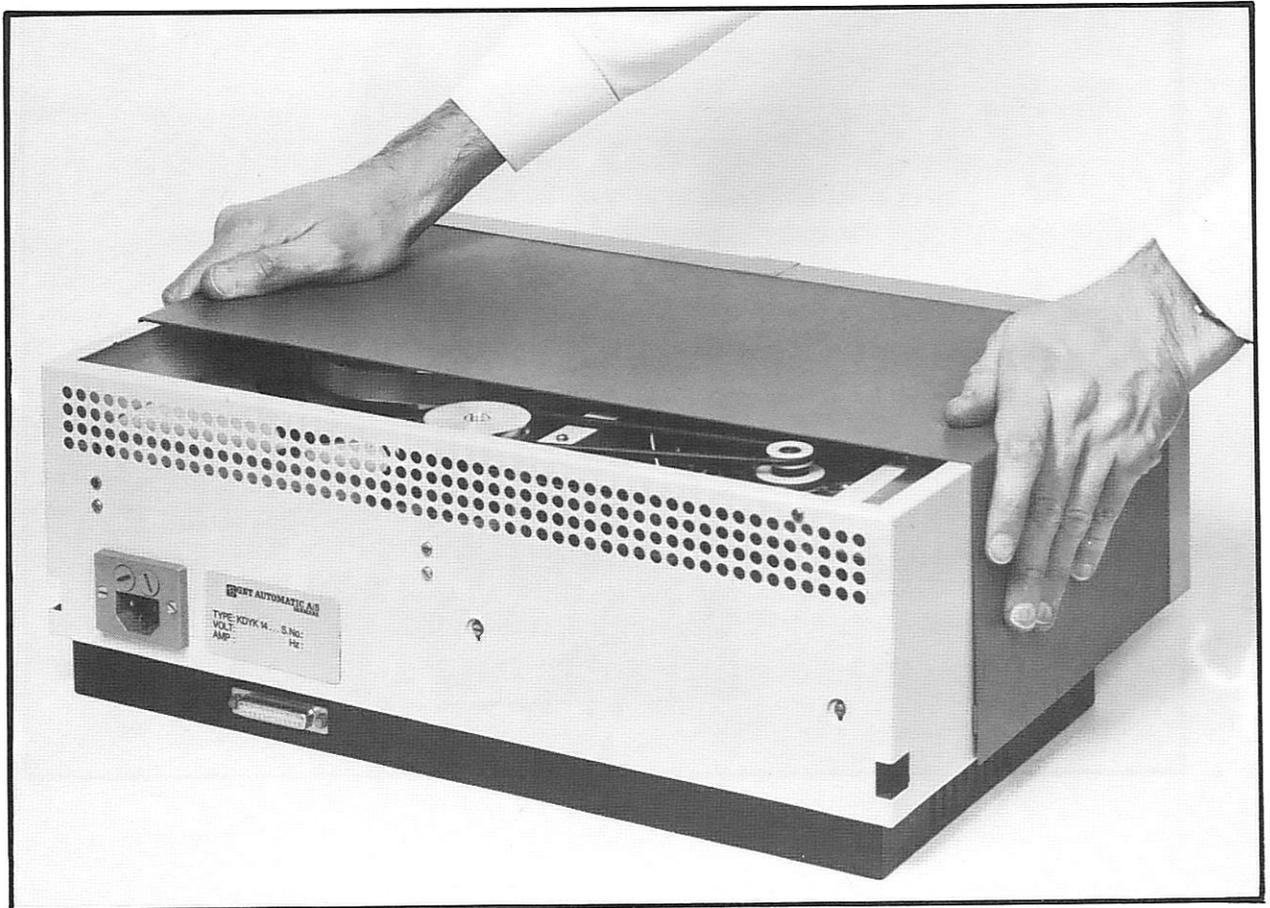
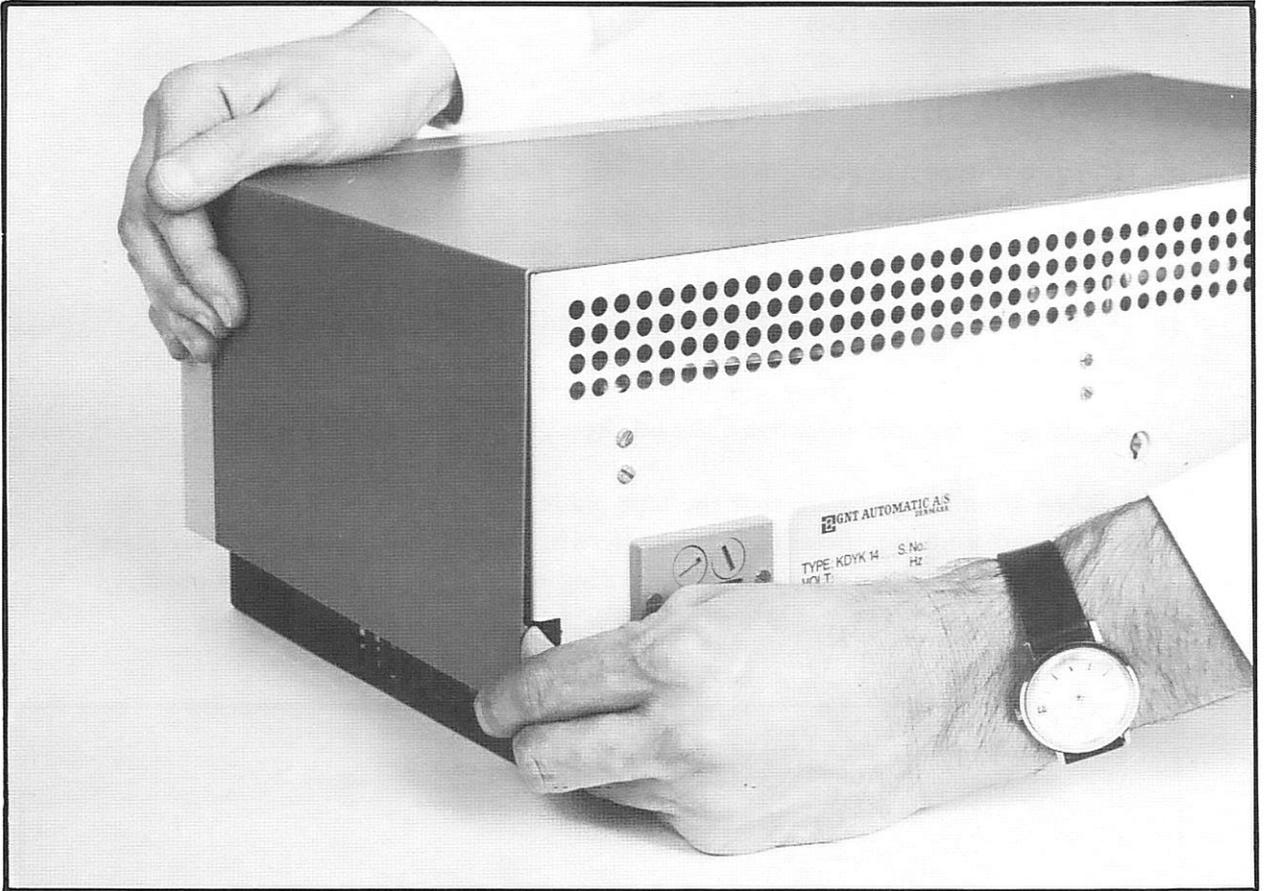
- a) Press the top cover backwards (by applying pressure to the front edge), and at the same time, lift out the lugs on either side at the rear. See Fig. 6.30.
- b) The cover can now be slid forward and completely removed.

6.3.2 Removing Capstan Pulley Drive Belt

- a) Remove the top cover as described in Section 6.3.1.
- b) Remove the belt.

6.3.3 Removing Round-Sectioned Punch Drive Belt

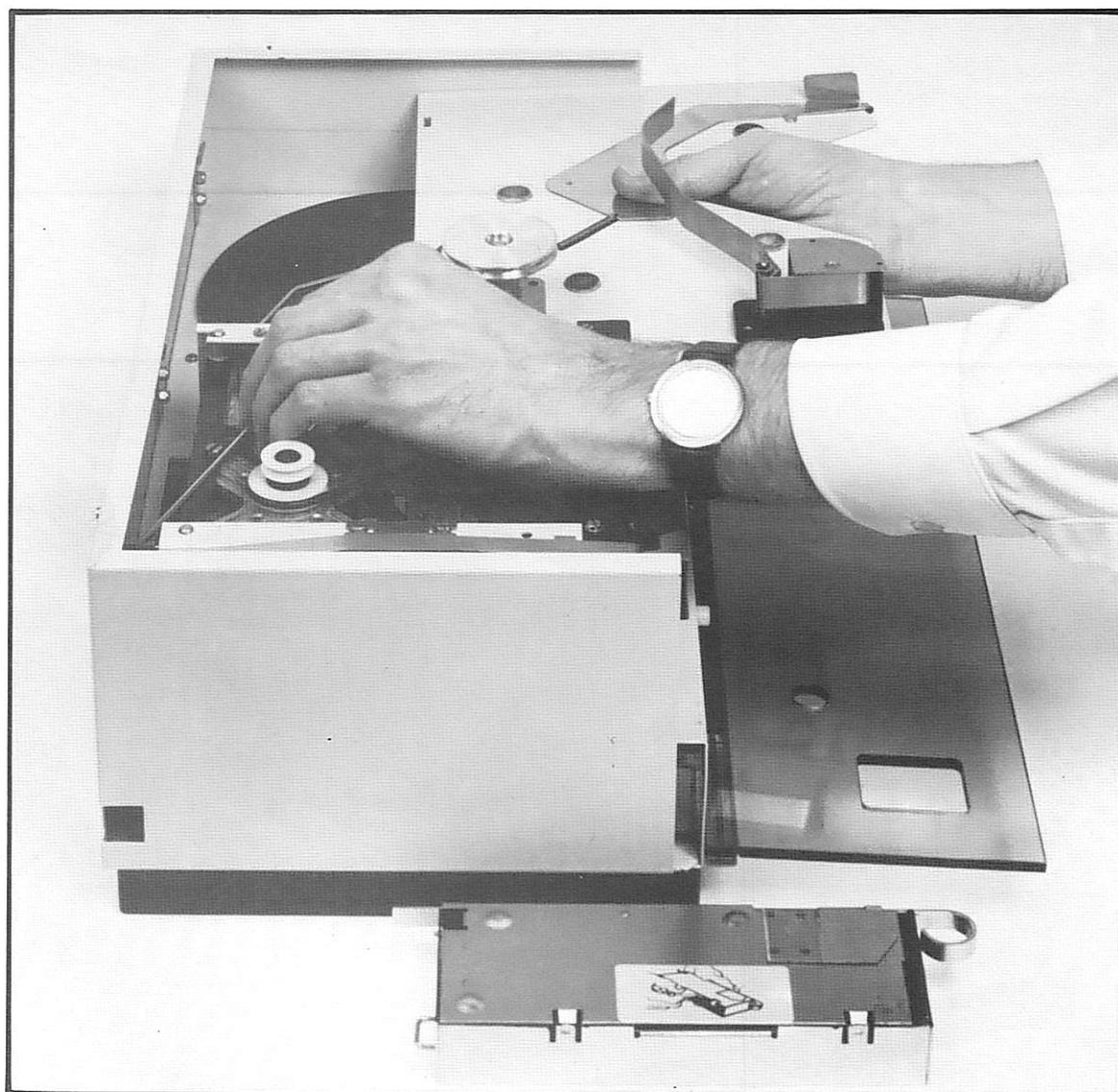
- a) Remove the capstan pulley drive belt as described in Section 6.3.2.
- b) Remove the punch drive belt.



6.3.4 Removing Intermediate Plate

- a) Remove the upper disc (see Section 3.5).
- b) Remove the capstan pulley drive belt as described in Section 6.3.2.
- c) Take hold of the capstan pulley, and lift the intermediate plate off the left hinge.
- d) Place a hand under the intermediate plate, and lift it off the right hinge.
- e) Remove the plate by lifting it upwards and sliding it forwards, so that the interconnecting arm slides out of its bracket.

N.B. When assembling, ensure that the tape guide box is removed before fitting the intermediate plate. (See Fig. 6.31). Otherwise the interconnecting arm may hook up with the roller unit, thereby preventing the equipment from functioning.



6.3.5 Removing Punch Unit

- a) Separate the chassis from the base (Section 6.3.29). Disconnect the signal cable from the punch, and free the motor cable. Close the chassis again.
- b) Remove the intermediate plate as described in Section 6.3.4.
- c) Pull out the tape guide box.
- d) Turn the two sunken screws at the rear of the punch station through a quarter of a turn each. See Fig. 6.32.
- e) Slide the punch unit backwards, and lift it up and out of the chassis.
- f) The punch unit can now be placed beside the punch station. To remove it completely, it is necessary to disconnect the motor cable. See Section 6.3.30.



6.3.6 Removing Motor from Punch Unit

- a) Remove the punch unit as described in Section 6.3.5.
- b) Remove the round-sectioned punch drive belt, and disconnect the earthing connection between the motor and the punching mechanism.
- c) Remove all the circlips from the securing rods. See Fig. 6.33.
- d) Slide the securing rods out of the holes in the punch unit housing, and then slide the motor unit backwards out of the housing.

N.B. When reassembling, ensure that the securing rods are the right way round (the ends with the 3 circlip rings should be at the top).

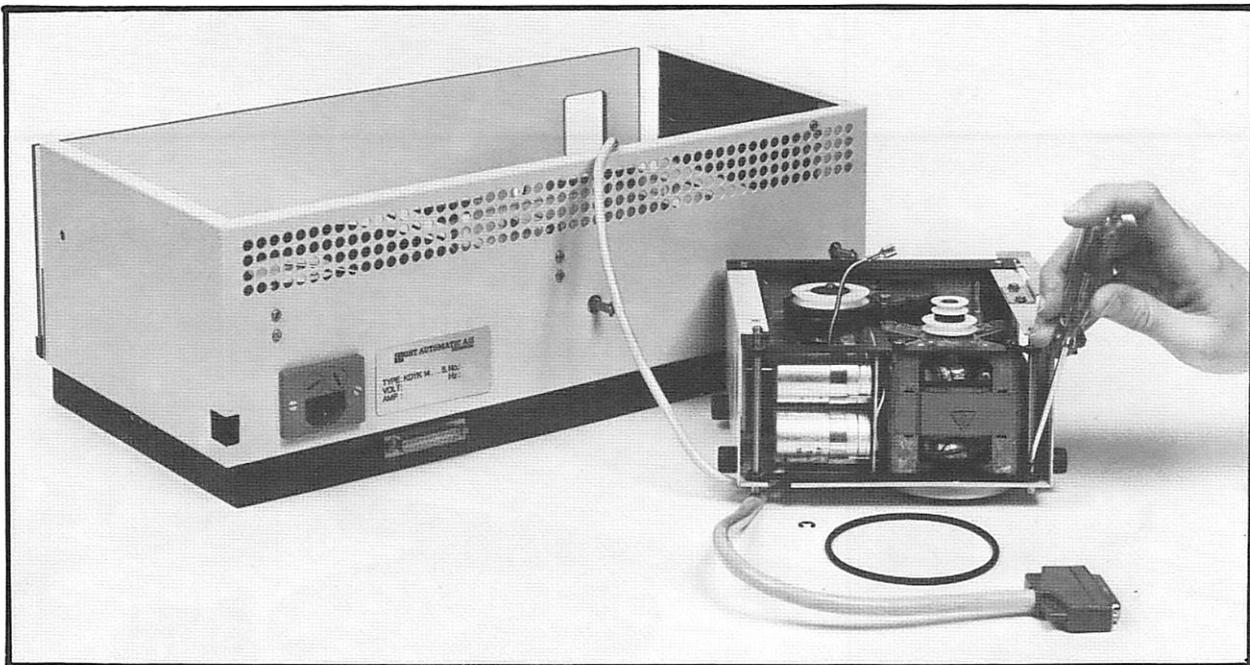


Fig. 6.33 Removing Motor From Punch Unit

6.3.7 Removing Punching Mechanism from Punch Unit

- a) Remove the motor unit as described in Section 6.3.6.
- b) Unscrew the 2 screws holding the visor (see Fig. 6.34), and remove the visor. Note that the clear plastic flap comes off at the same time.
- c) Release the locking rod from the catch on the right hand side of the housing. See Fig. 6.35.
- d) Slide the punching mechanism forward and out of the punch unit housing.

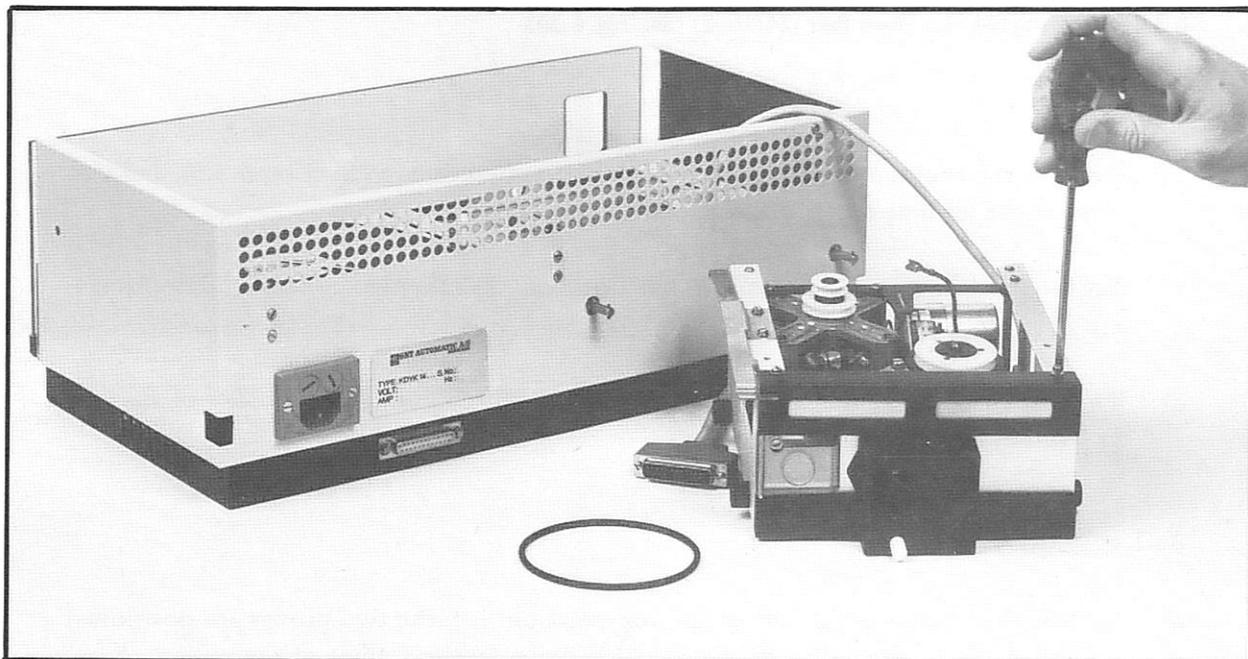


Fig. 6.34 Loosening Visor Screws

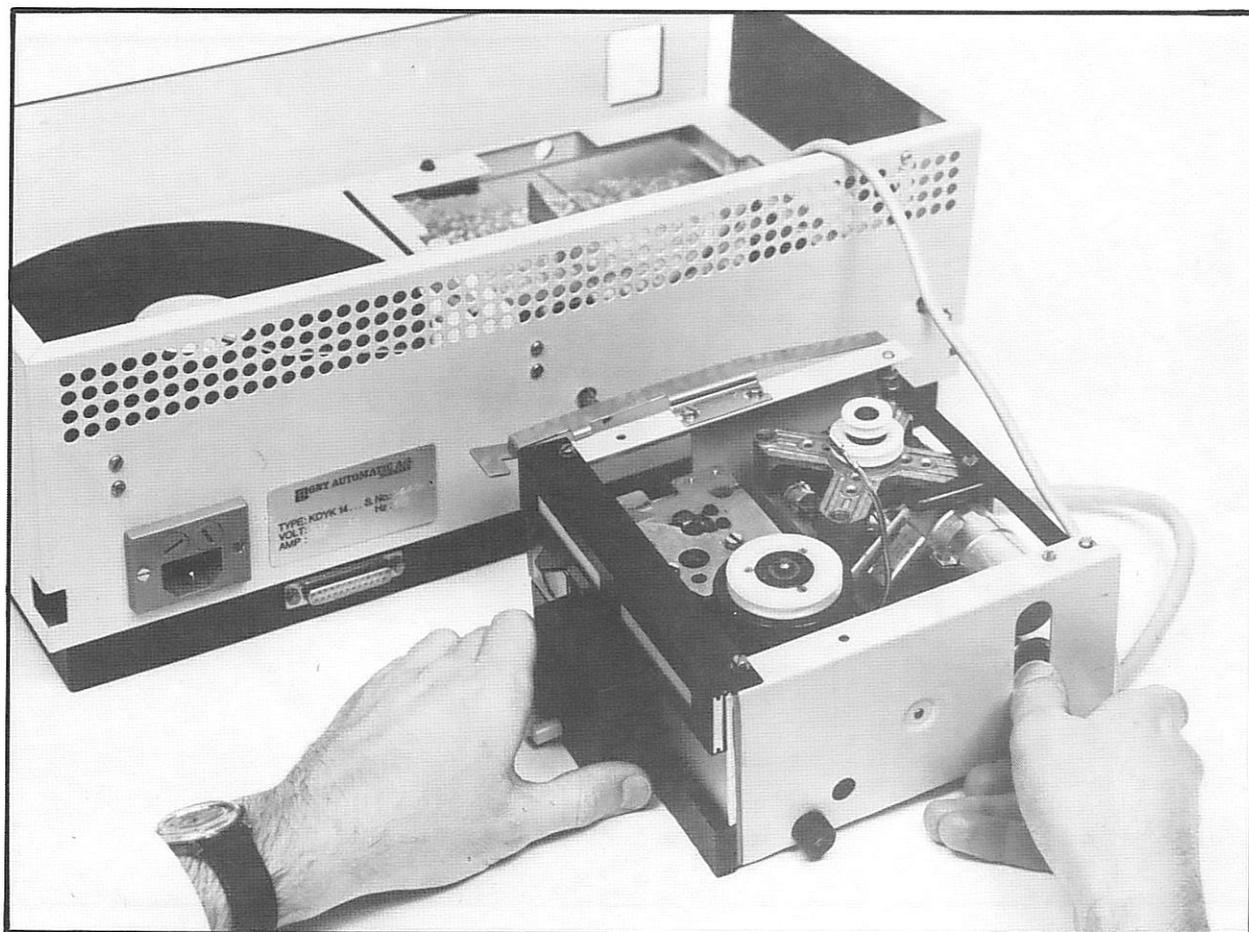


Fig. 6.35 Releasing Locking Rod

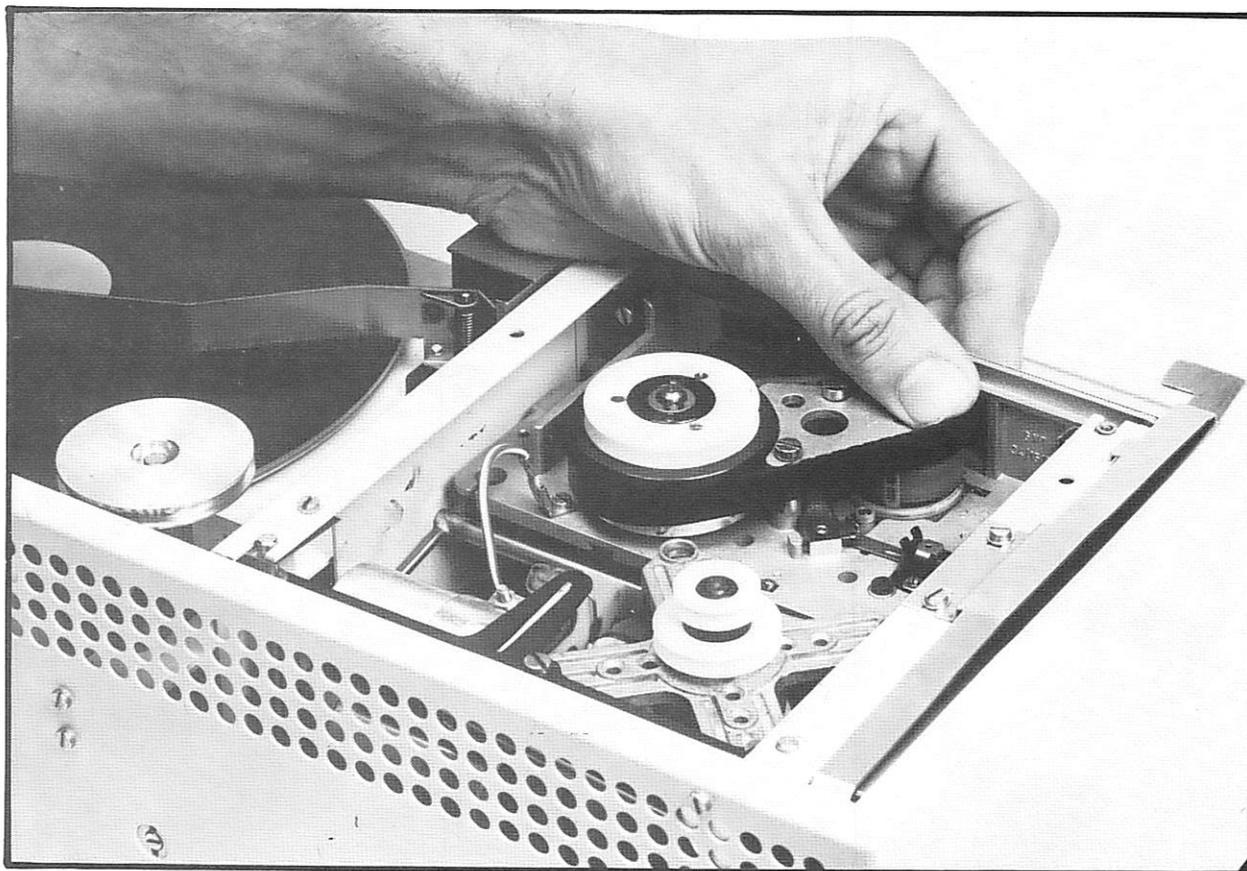
6.3.8 Replacing the Flat Drive Belt (34/1692) (See Fig. 6.36)

REMOVAL

- a) Remove the round-sectioned punch drive belt as described in Section 6.3.3., and also remove the visor as described in Section 6.3.7, step b.
- b) Ensure that the punch is in its stop position, i. e. that the two control clutch prongs are not engaged in the drive belt.
- c) The belt can now be slid up and off the control clutch pulley (the smaller of the two pulleys).

REASSEMBLY

- d) Be sure that the punch is still in the stop position, i. e. the two prongs are positioned on either side of the pulley bearing plate and not on the surface of the pulley where the belt will ride.
- e) First place the flat belt around the centrifugal clutch (the larger pulley). Then slide the other end of the belt across the bearing plate and onto the control clutch pulley.
- f) Rotate the belt a few times to be sure it is seated properly.



6.3.9 Replacing Centrifugal Clutch (See Fig. 6.37)

- a) Remove the punching mechanism as described in Section 6.3.7.
- b) Remove the flat drive belt as described in Section 6.3.8, steps b and c.
- c) Remove the selector box as described in Section 6.3.12.
- d) Unplug the numbered plugs from the patch board. Loosen the 2 screws which hold the patch board and remove the board.
- e) Unscrew the fastening screw from the right end of the cable duct, and move the duct slightly to gain access to one of the clutch fastening screws.
- f) Unscrew the 3 screws which hold the clutch unit on the side of the chassis opposite the flat drive belt.
- g) Withdraw the clutch unit.

N.B. When replacing the flat drive belt, follow the procedure described in Section 6.3.11, steps d, e and f.

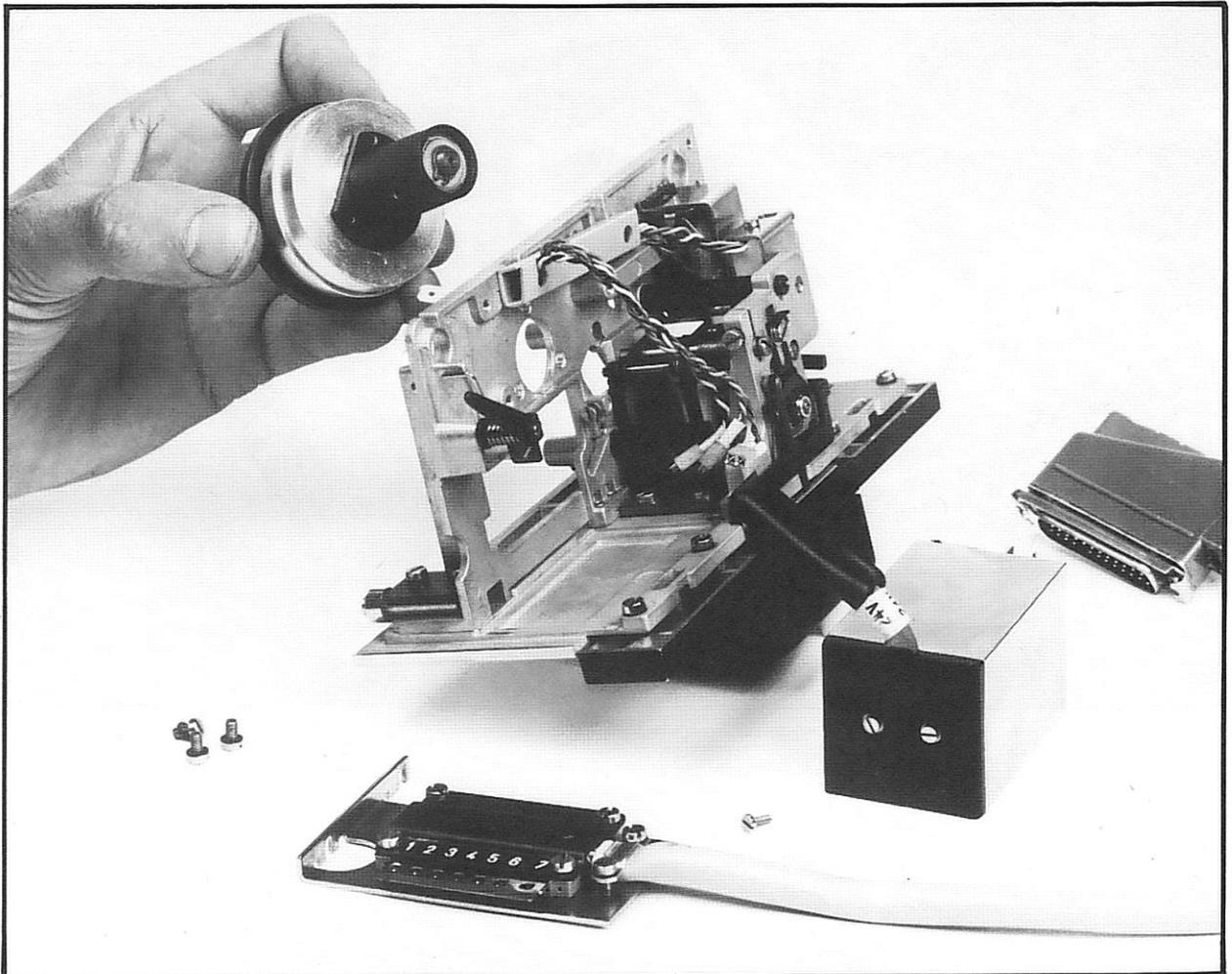


Fig. 6.37 Replacing the Centrifugal Clutch

6.3.10 Removing the Control Clutch Pulley (34/1652) (See Fig. 6.38)

REMOVAL

- a) Remove the flat drive belt as described in Section 6.3.8.
- b) Unscrew the two screws which hold the pulley bearing plate, and remove the unit.

REASSEMBLY

- c) Position the unit by inserting a 3 mm diameter rod (with a flat end) through the hollow pulley axle and into the corresponding hole in the clutch.



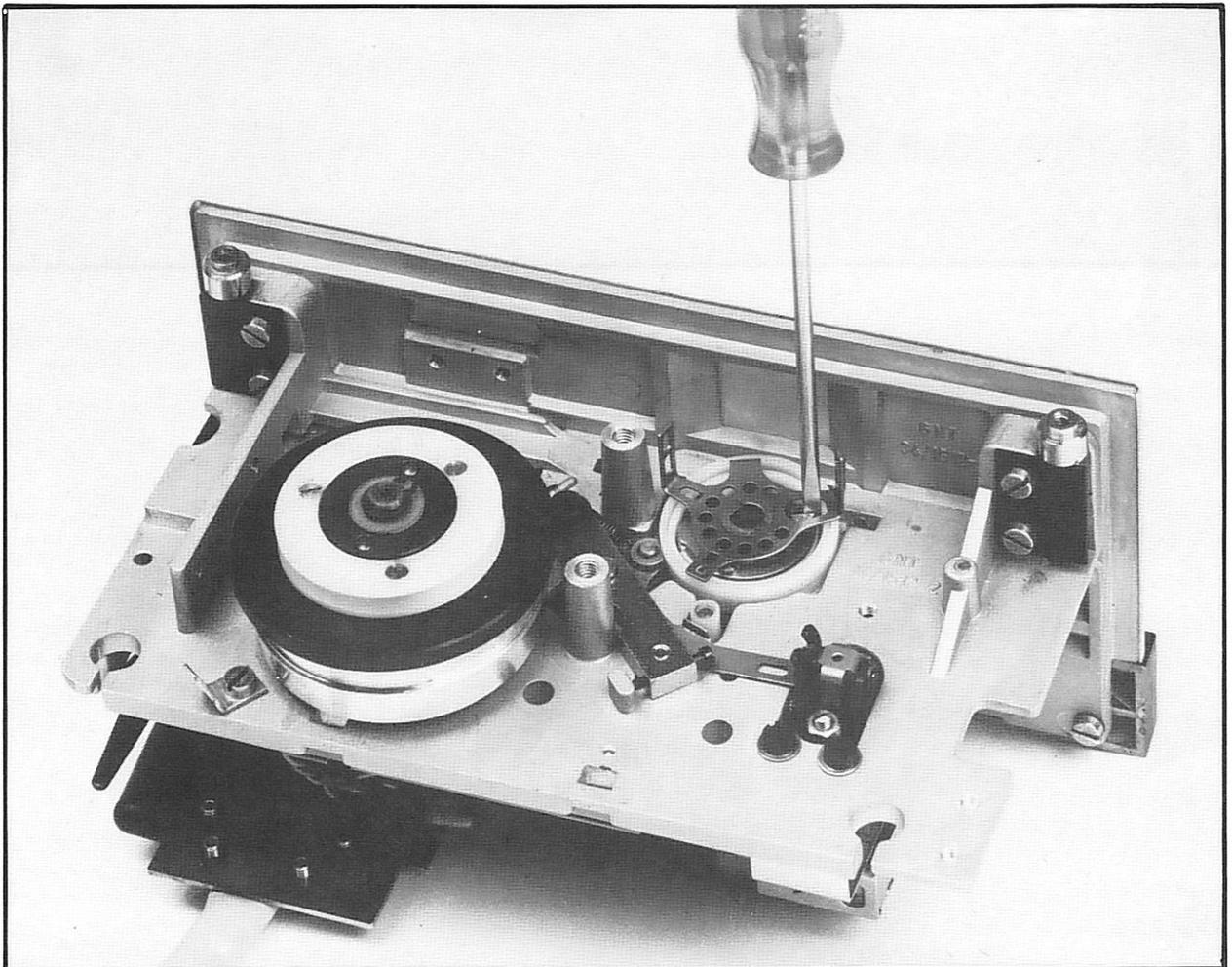
6.3.11 Replacing the Three-pronged Driven Part (34/1670) (See Fig. 6.39)

REMOVAL

- a) Remove the punching mechanism as described in Section 6.3.7, and remove the control clutch pulley as described in Section 6.3.10.
- b) Unhook the start spring from its anchor on the chassis.
- c) Unscrew the 3 screws which fasten the brake ring support ring. It will be necessary to rotate the driven part to get to the screws. Note that the crescent-shaped fastener drops off from behind.
- d) Withdraw the driven part and support ring.

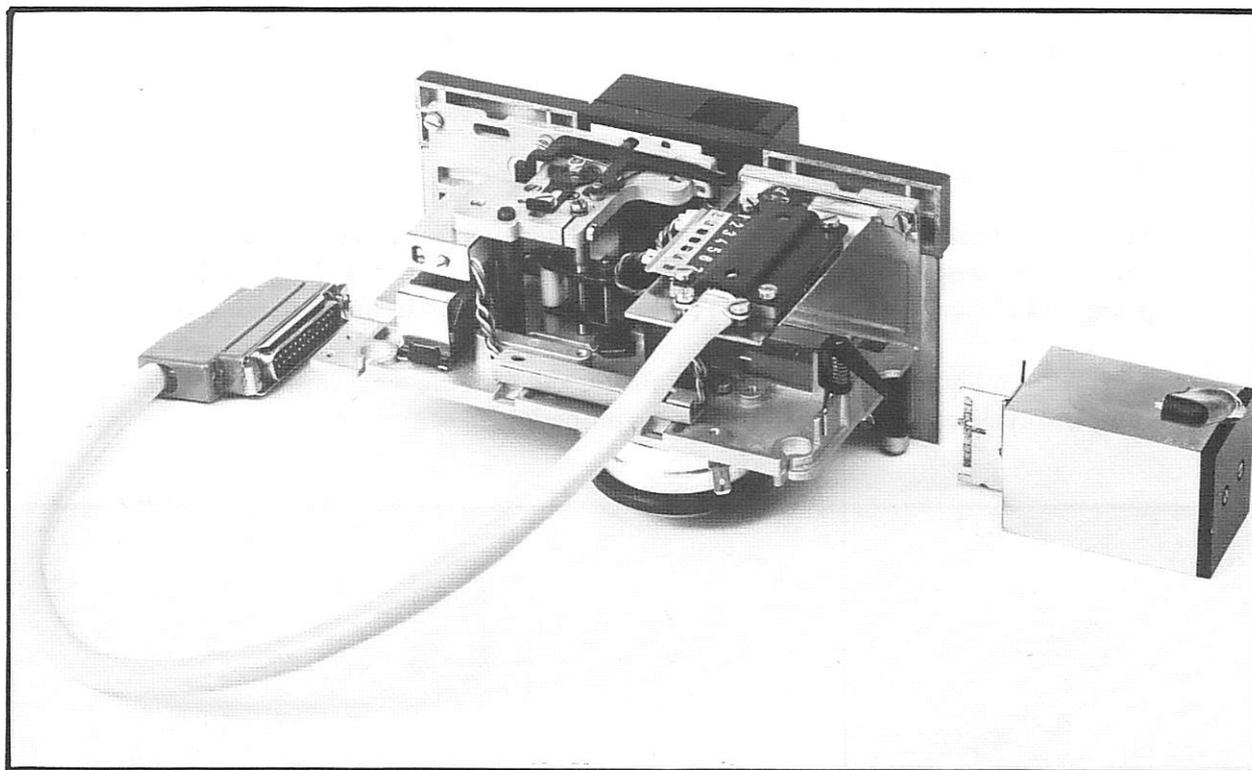
REASSEMBLY

- e) Turn the mechanism so that the reset bushing is away from the clutch lever (transport pins up). Insert the driven part and support ring so that both the brake prong and the tab on the support ring are positioned towards the clutch lever.
- f) After reassembly, release the clutch manually, and turn the mechanism through a complete cycle to be sure it is functioning properly.



6.3.12 Removing the Selector Box (34/2202) (See Fig. 6.40)

- a) Dismantle as described in Section 6.3.7.
- b) Unplug the short cable which connects the selector box to the patch board.
- c) Depress the retaining lever, and slide the selector unit out of the punch mechanism.



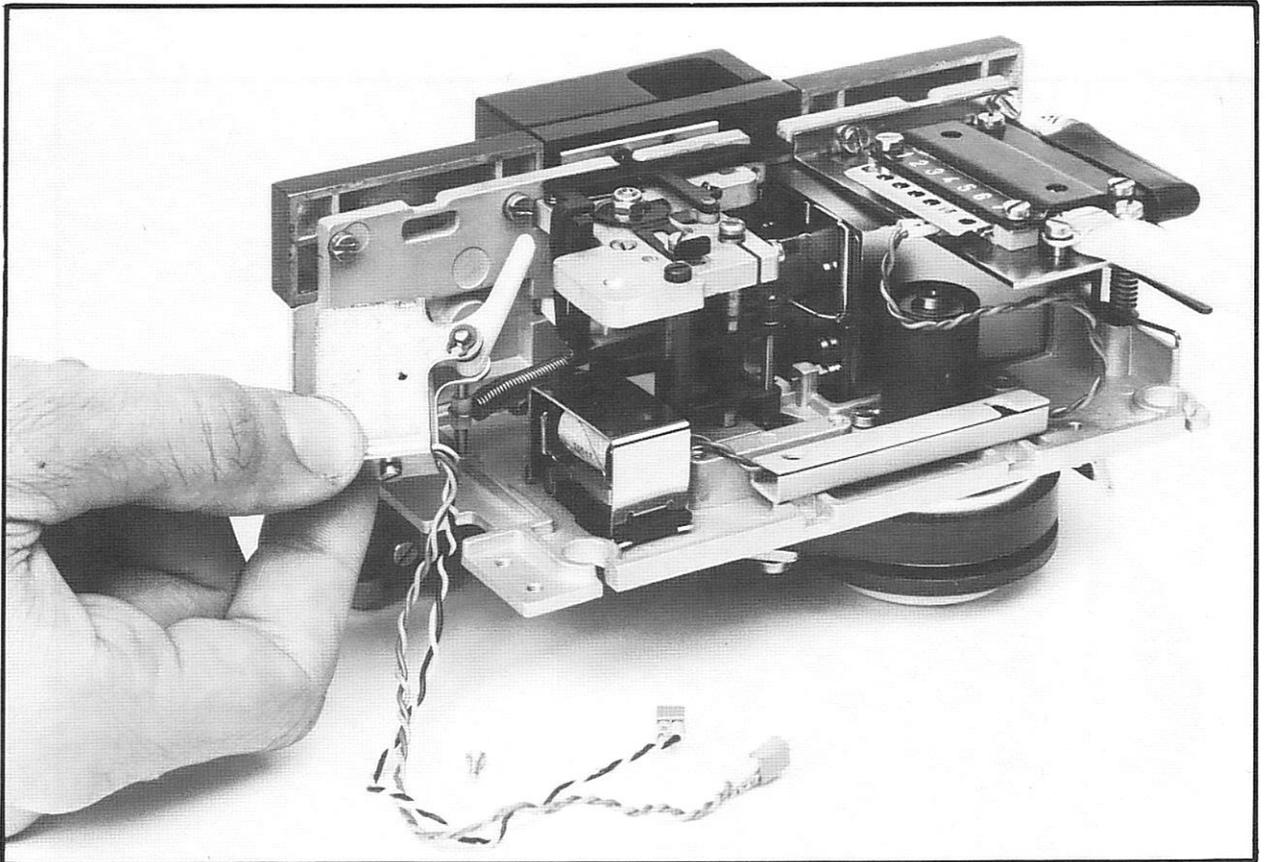
6.3.13 Replacing the Timing Contacts (34/2400) (See Fig. 6.41)

REMOVAL

- a) Dismantle according to Section 6.3.7.
- b) Unplug plugs number 1 and number 2 from the patch board, and pull the wires out of the plastic conduit.
- c) Unscrew the one counter-sunk screw which holds the contact housing, and carefully remove the unit.

REASSEMBLY

- d) Be certain that the two actuating arms are riding correctly on the cams and that the centering pin (the axle for the actuating arms) is in its hole. Notice that the axle has no groove for its lock ring. Be careful that the axle remains in the correct position (see Fig. 5.7).
- e) If the contacts have been changed, carry out the electrical adjustment, Section 6.2.7.



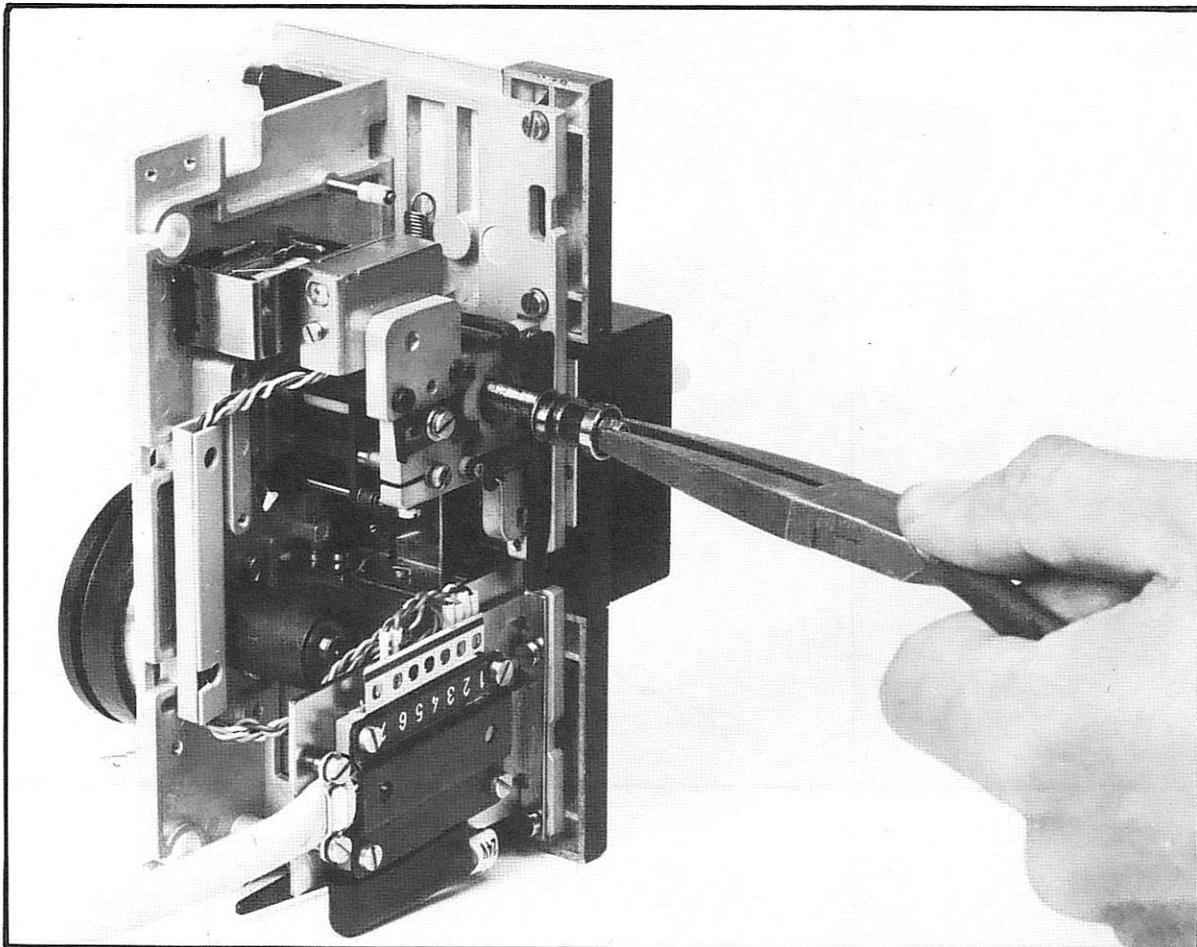
6.3.14 Replacing the Main Shaft (See Fig. 6.42)

REMOVAL

- a) Dismantle according to Section 6.3.6.
- b) Be sure that the punch is in the stop position.
- c) Removing the start spring from its mooring on the chassis.
- d) Loosen the screw which holds the Y-clamp against the main shaft ball bearing, and slide the clamp out of the way.
- e) While holding the timing contact actuating arms out of the way, grasp the main shaft nut with a pliers, and withdraw the shaft.

REASSEMBLY

- f) Be sure that the clutch is still in the stop position. While holding the cam levers out of the way, insert the main shaft with its carrier upwards (see Fig. 5.4).
- g) After remounting the spring and Y-clamp, manually release the clutch, and rotate the mechanism through its cycle to be sure that the main shaft has not accidentally been turned 180° during insertion.



6.3.15 Replacing the Clutch Magnet (34/1904) (See Fig. 6.43)

REMOVAL

- a) Dismantle according to Section 6.3.7.
- b) Remove the timing contacts (Section 6.3.13). It is not necessary to unplug and free the wires.
- c) Unplug plug number 6 from the patch board, and pull the wires out of the plastic conduit.
- d) Squeeze the magnet frame between your thumb and forefinger, and unclip the magnet, top end (nearest the pawl) first.

REASSEMBLY

If the magnet has been changed, the adjustment procedure, Section 6.2.1 must be followed. Otherwise, replace as follows:

- e) Turn the punch mechanism manually so that the pawl moves down.
- f) Be careful not to reverse the position of the magnet. (See Fig. 5.4). Clip the magnet in place, bottom end (away from the pawl) first.
- g) Replace the wires in the conduit. Replace the plug, being sure that the plug number (6) is visible in the window.

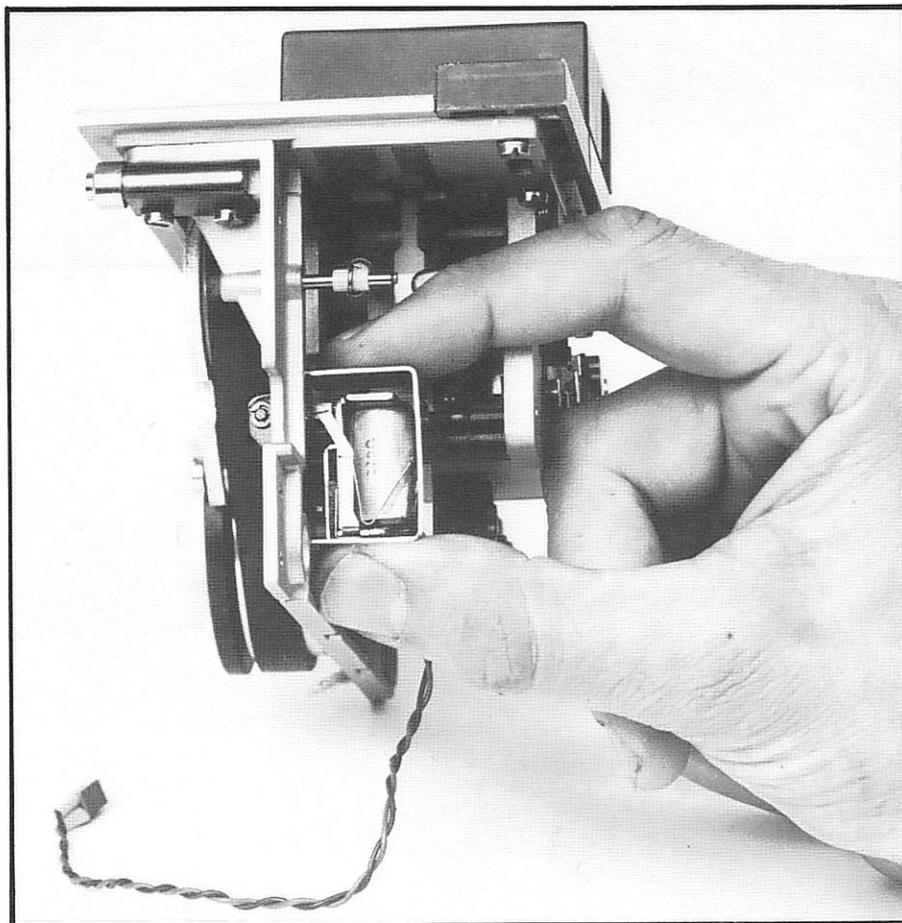
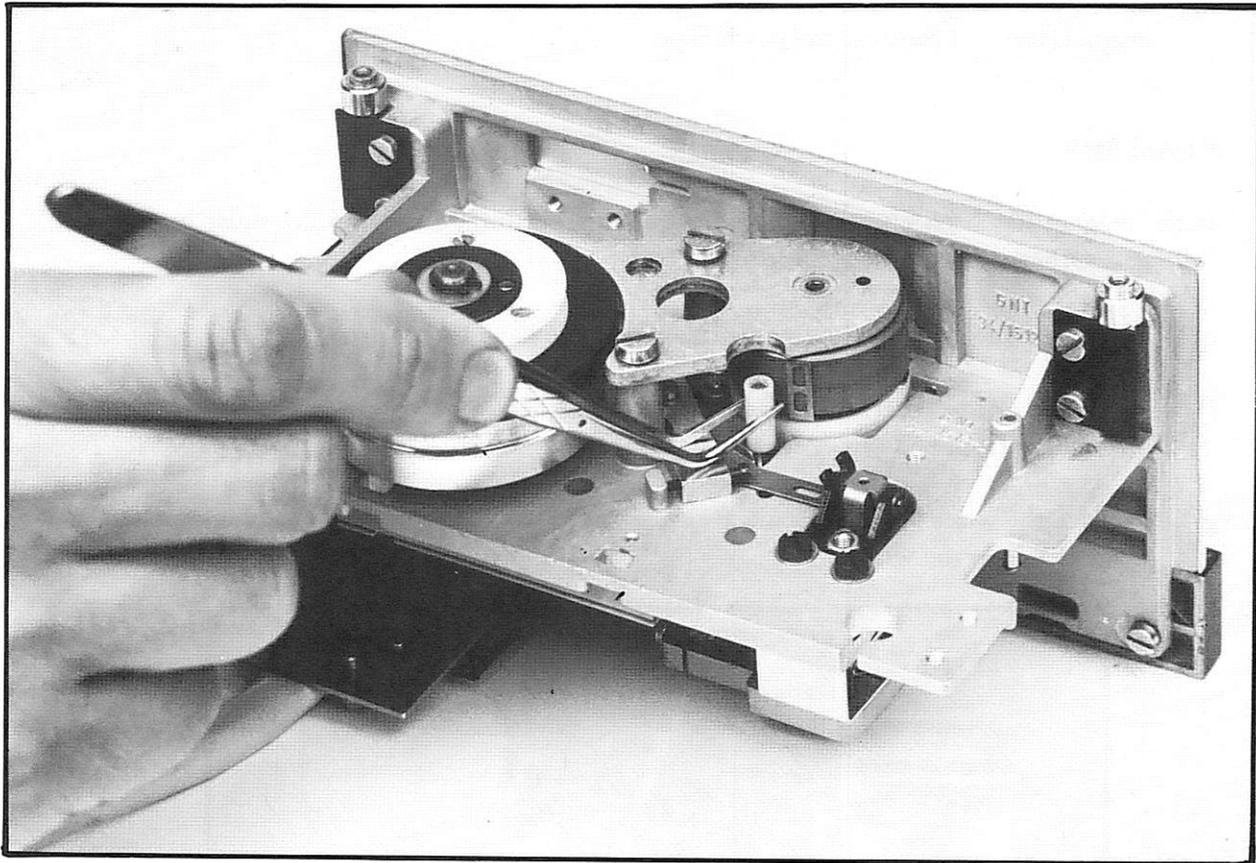


Fig. 6.43 Replacing the Clutch Magnet

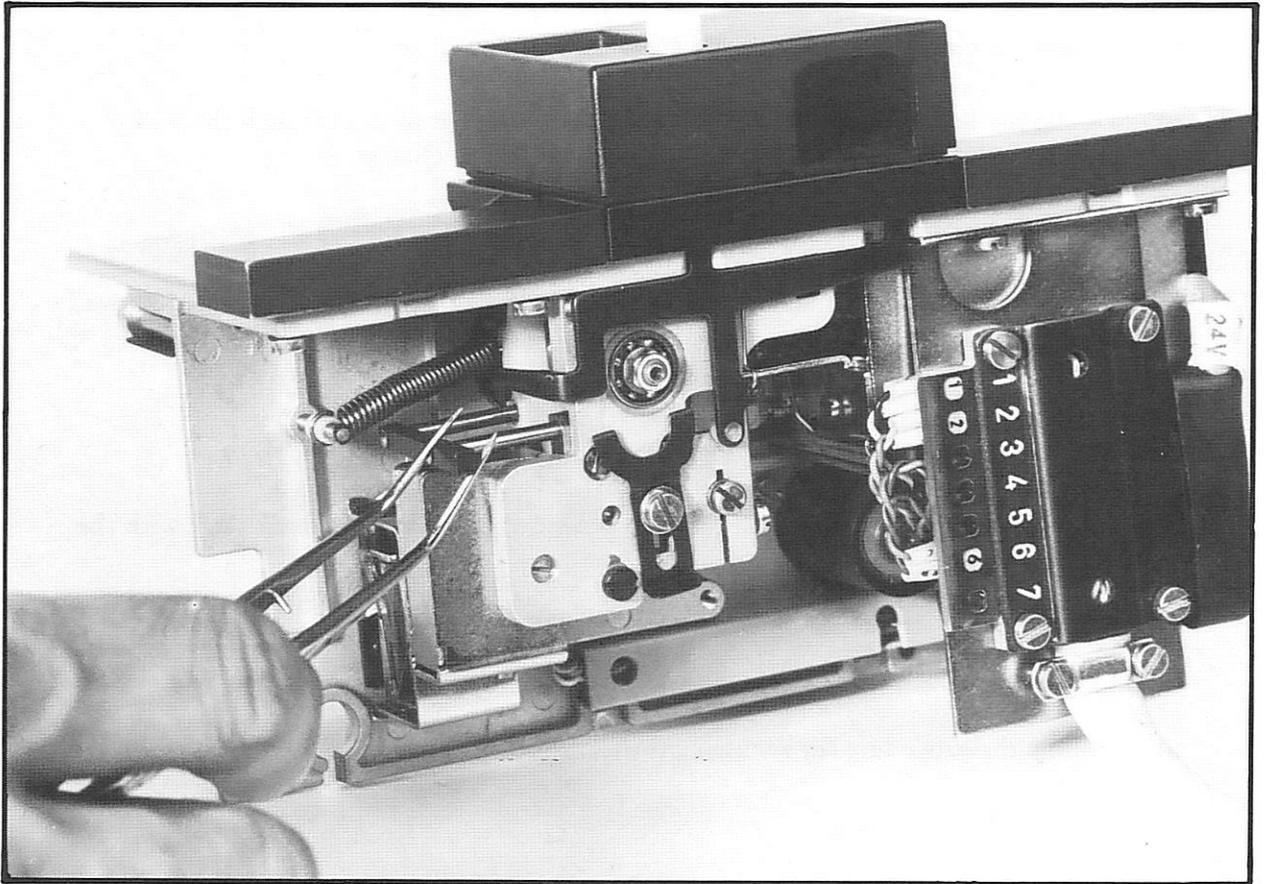
6.3.16 Removing the Reset Bushing (34/1786) (See Fig. 6.44)

- a) Remove the flat drive belt as described in Section 6.3.8
- b) Unhook the short spring from its anchor on the chassis.
- c) Remove the spring clip from the bushing shaft where it passes through the rocker arm.
- d) Using a tweezers, withdraw the bushing from the belt side of the chassis.



6.3.17 Removing the U-bracket (34/1852) (See Fig. 6.45)

- a) Remove the selector box as described in Section 6.3.12.
- b) Unclip the lock ring on the U-bracket axle which passes through the brass bearing.
- c) Slide the U-bracket out.



6.3.18 Replacing the Transport Head (34/1842, 1843) (See Fig. 6.46)

REMOVAL

- a) Remove the U-bracket as described in Section 6.3.17.
- b) Loosen the screw which holds the Y-clamp against the main shaft bearing, and slide the clamp out of the way.
- c) Unhook the start spring from its anchor on the chassis.
- d) Remove the timing contacts (see Section 6.3.13).
- e) Unhook the spring from the eye on the tape release arm, and remove the arm.
- f) Unclip the clutch magnet, top end (nearest the pawl) first.
- g) Unclip the lock ring on the reset bushing shaft where it passes through the rocker arm, and withdraw the shaft from the belt side of the chassis.
- h) Grasp the main shaft nut with a pliers, and withdraw the shaft.
- i) The transport head, connecting rod, start spring and flat spring can now be removed as a unit.

REASSEMBLY

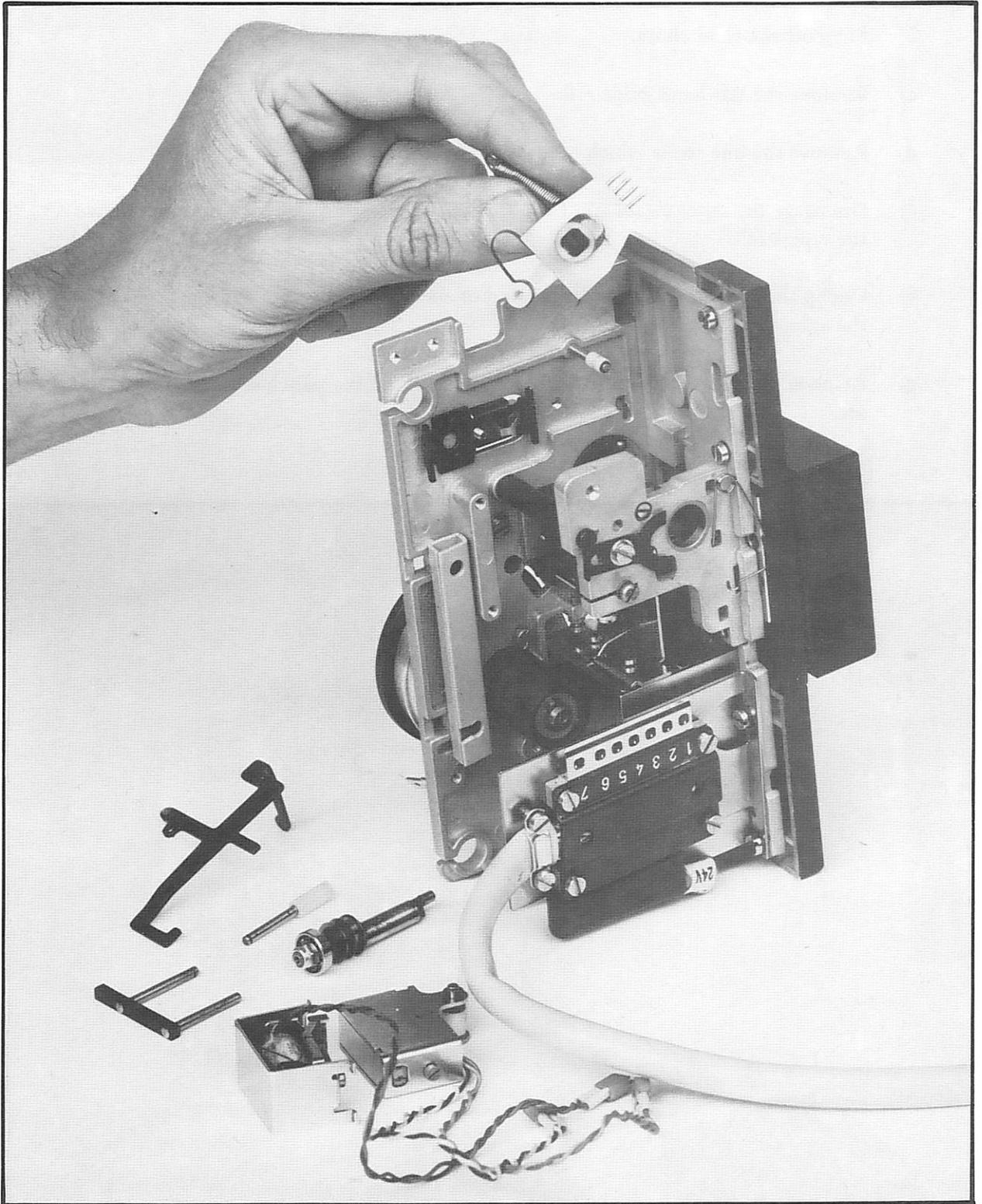
- j) Be sure the control clutch is in the stop position, and insert the main shaft with the carrier upwards. (See Fig. 5.5).

6.3.19 Removing the Flat Spring (34/1845)

- a) Follow the procedure for removing the transport head, Section 6.3.18.
- b) Remove the flat spring.

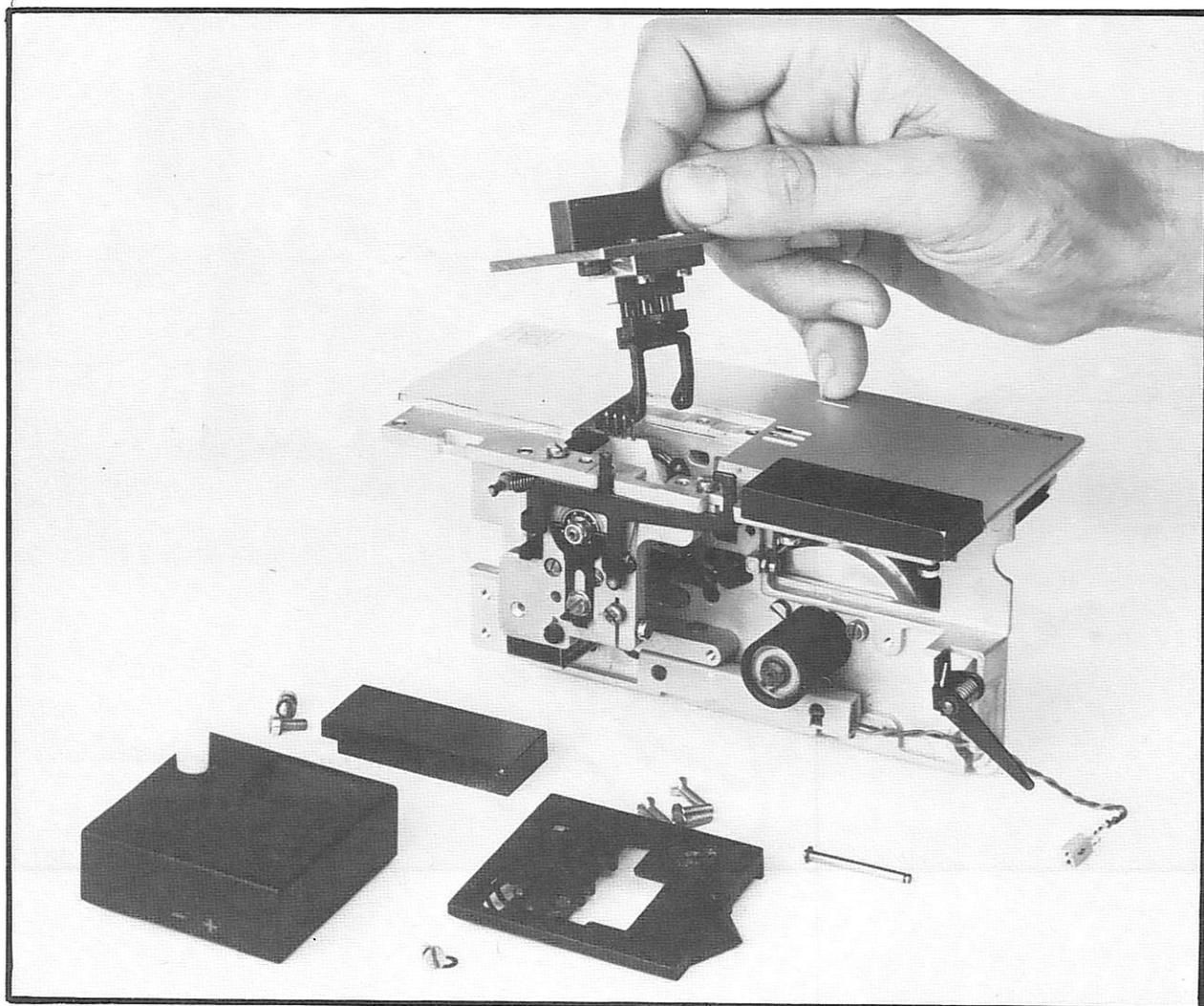
6.3.20 Removing the Start Spring (34/1788)

- a) Follow the procedure for removing the transport head, Section 6.3.18.
- b) Remove the start spring.



6.3.21 Replacing the Punch Set (34/1702, 1703) (See Fig. 6.47)

- a) Dismantle according to Section 6.3.12 (Removing the Selector Box).
- b) Snap off the chad chute.
- c) Remove the left hand guide rail.
- d) Remove the one screw which holds the tape latch unit.
- e) Disengage the tape release arm from the tape guide arm (see Fig. 5.6), and remove the tape latch.
- f) Unclip the lock ring from the inner end of the punching bridge axle, and withdraw the axle.
- g) Remove the 4 screws (on the die block) which hold the punch set, and lift out the set.



6.3.22 Replacing the Clutch Release Mechanism (Bracket) (34/1950) (See Fig. 6.48)

REMOVAL

- a) Dismantle according to Section 6.3.7, and remove the clutch magnet (Section 6.3.15). It is not necessary to unplug and free the magnet wires.
- b) Turn the punch mechanism so that the clutch lever is in its highest position (almost out of engagement with the pawl).
- c) Remove the 2 fastening screws, and carefully withdraw the bracket.

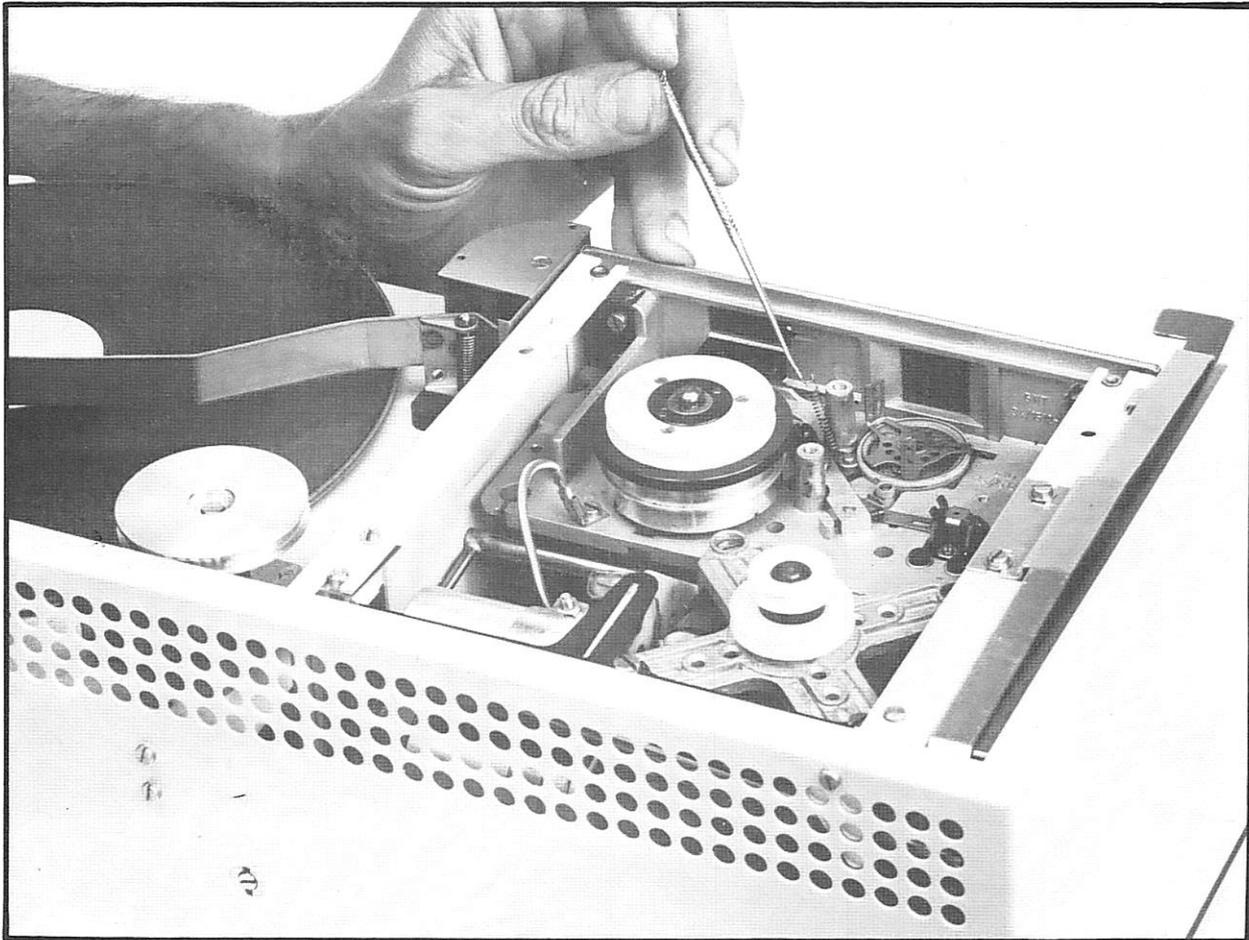
REASSEMBLY

- d) If the bracket has been changed, the entire adjustment procedure, Section 6.2.1, must be followed. Otherwise, only steps f - m need be carried out.



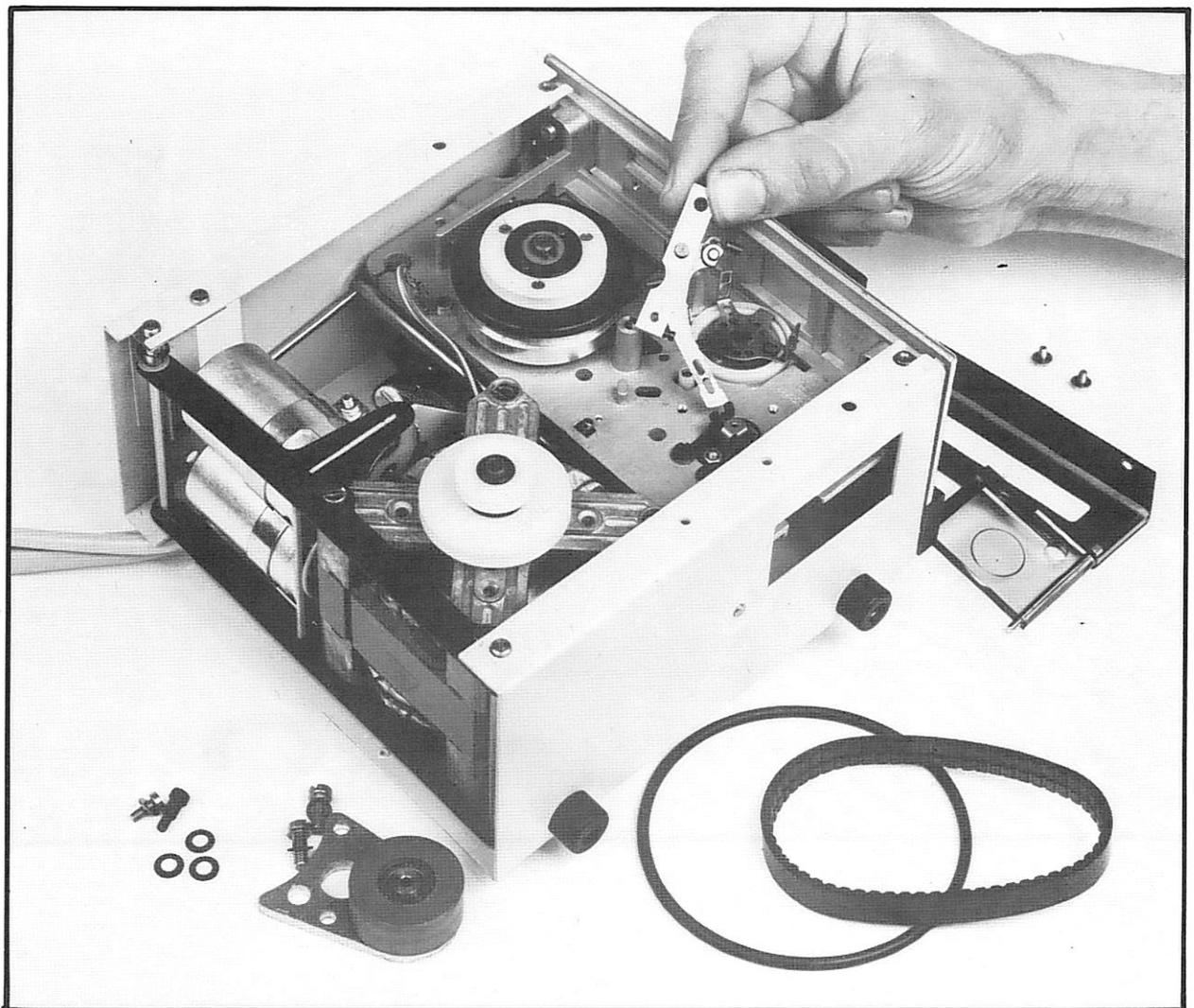
6.3.23 Removing the Clutch Lever Spring (34/1966) (See Fig. 6.49)

- a) Remove the flat belt. (See Section 6.3.8).
- b) Unscrew the 2 screws which fasten the bearing plate and pulley unit, and remove the unit.
- c) Using a spring hook, remove the spring.



6.3.24 Removing the Clutch Lever (34/1963) (See Fig. 6.50)

- a) Remove the flat drive belt as described in Section 6.3.8.
- b) Unscrew the 2 screws which hold the control clutch pulley, and remove the unit.
- c) Using a spring hook, unhook the clutch lever spring from its mooring on the chassis.
- d) Remove the support arm lock screw from the other side of the chassis.
- e) Remove the mounting screw which holds the support arm. Note the washer placement.
- f) Release the clutch magnet manually, so that the clutch lever is free of the pawl.
- g) Remove the clutch lever/support arm assembly.
- h) The clutch lever can now be separated from the support arm by removing the clip ring. Note the washer and lubrication felt placement.



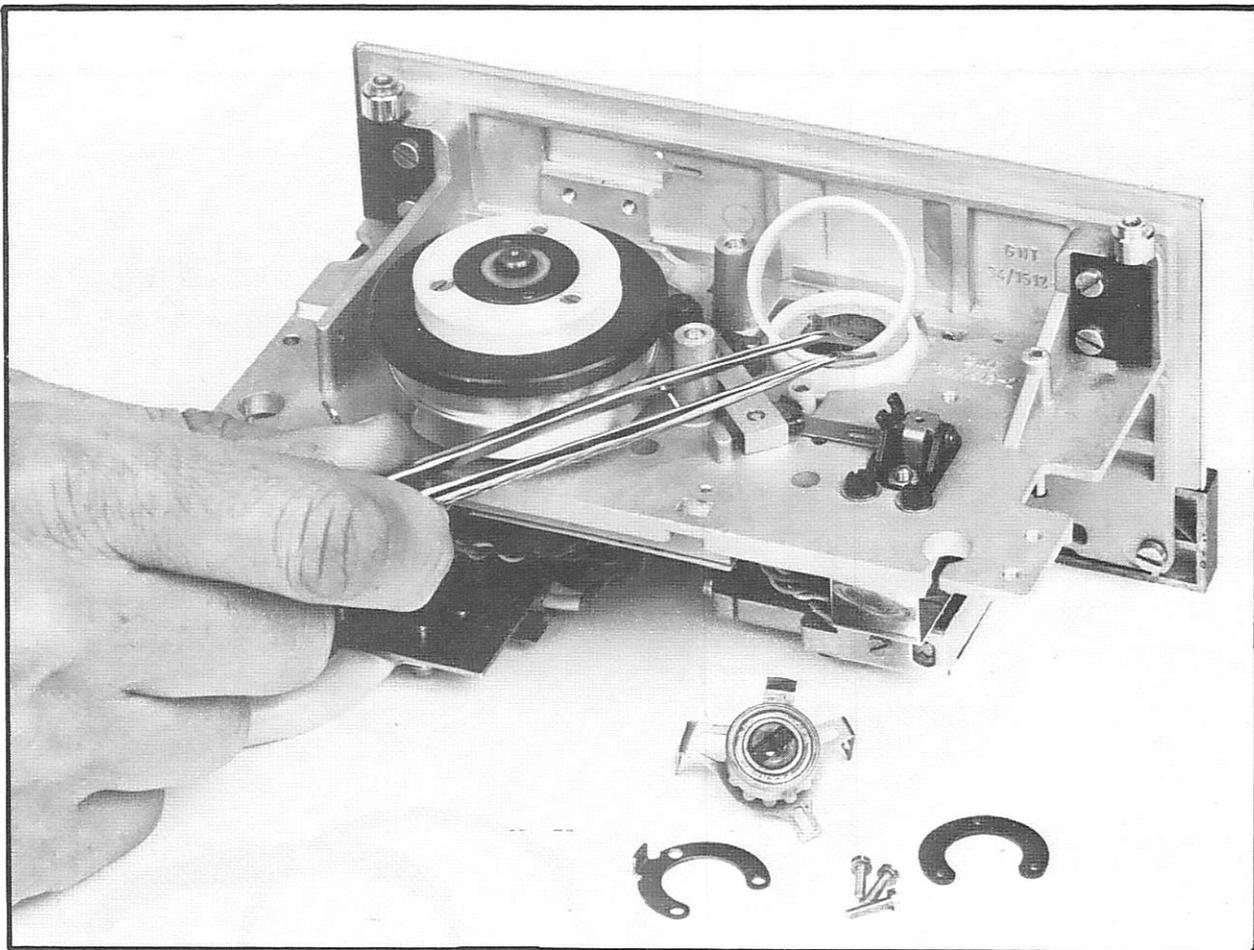
6.3.25 Replacing the Brake Rings (34/1982 and 1986) (See Fig. 6.51)

REMOVAL

- a) Remove the 3-pronged driven part as described in Section 6.3.11.
- b) Lift out the brake rings.

REASSEMBLY

- c) Insert the new rings.
- d) Follow steps e and f, Section 6.3.11.



6.3.26 Removing Capstan Unit and Drive Wheel

Remove the top cover (see Section 6.3.1). Remove the 2 screws holding the capstan unit to the intermediate plate. Lift up the capstan unit, whereupon the drive-wheel will slide off its axle.

6.3.27 Removing Tape Duct Unit

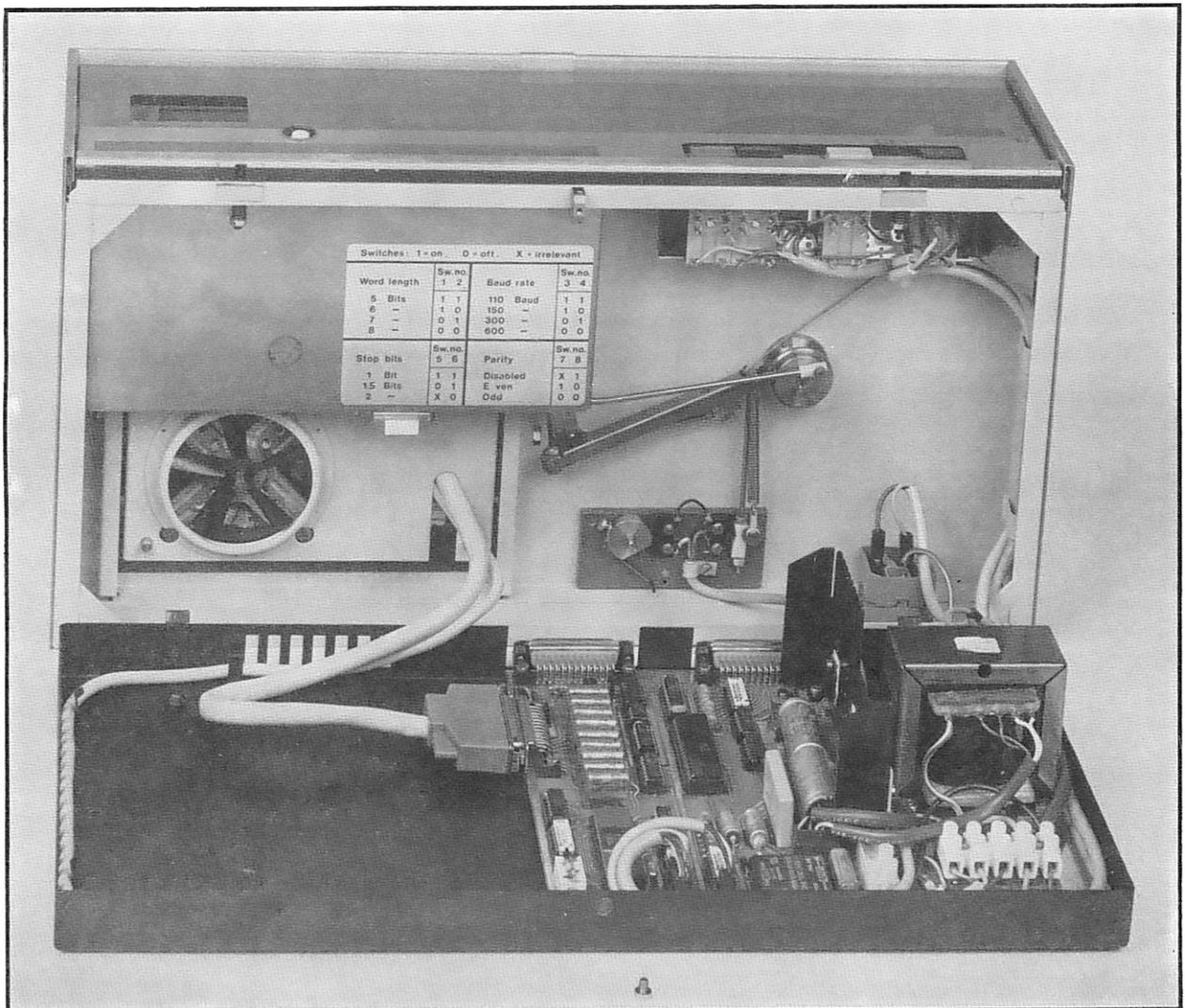
Remove the top cover (see Section 6.3.1). Remove the fixing screw, then slide the roller and remove the locking nut (see Fig. 6.29). The tape duct unit can now be lifted off the intermediate plate. N. B. When reassembling, see Sections 6.2.16 and 6.2.17.

6.3.28 Removing Upper Disc Edge Band

Remove the upper disc (see Section 3.5). The edge band is removed by simply pulling it off over the face of the disc.

6.3.29 Separating Chassis from Base

Undo the screw which secures the chassis to the base, see Fig. 6.52. The front of the chassis can now be lifted upwards, the rear edges forming hinges.



6.3.30 Disconnecting Motor Cable

Having separated the chassis from the base (see Section 6.3.29), the motor cable can be disconnected from the terminal strip in front of the transformer. Note the cable colour code sequence for use when replacing.

6.3.31 Removing Transformer

Separate chassis from base (see Section 6.3.29). Disconnect the transformer cables and leads, noting colour code sequences for use when replacing. Remove the 4 nuts securing the transformer and lift it off the base.

6.3.32 Removing Logic P. C. B.

Separate chassis from base (see Section 6.3.29). Disconnect all cables and leads going to the p. c. b. Remove the 6 screws securing the p. c. b. and lift it off the base.

6.3.34 Removing Power Receptacle

Separate chassis from base (see Section 6.3.29). Disconnect the power leads and unscrew the nuts holding the receptacle to the chassis. The power receptacle can now be removed.

6.3.35 Removing Control Panel Lamp

Pull off the cover and remove the lamp using a pair of tweezers.

6.3.36 Removing Control Panel Unit

Separate chassis from base (see Section 6.3.29). Remove the 2 screws securing the control panel unit (see Fig. 6.53), and disconnect the 3 control panel cables at their remote ends. The push-button unit can now be removed.

6.3.37 Removing Micro-Switch

Separate chassis from base (see Section 6.3.29). Unsolder the wires going to the micro-switch and remove the 2 securing screws. N. B. When reassembling, see Section 6.2.10 (for tape-low micro-switch) or Sections 6.2.11 and 6.2.12 (for tape-error micro-switch).

6.3.38 Dismantling Lower Disc Hub

Separate chassis from base (see Section 6.3.29). Remove the screw in the centre of the lower face of the hub, see Fig. 6.21. The lower disc can then be lifted off the chassis and the lower hub face-plate removed from the hub. The two ball bearings can now be slid out. N. B. When reassembling, make sure that the brake is at the edge of (and not trapped under) the lower disc.

6.3.39 Removing Connecting Rod

Separate chassis from base (see Section 6.3.29). Remove the screw securing it to the lower hub face-plate. Disengage the other end of the connecting rod from the sweeper and remove it.



6.3.40 Removing Tension Arm Unit

Separate chassis from base (see Section 6.3.29). Remove the screw holding the tension arm unit to the lower disc hub (it may be necessary to rotate the hub face-plate to obtain access to this screw). Disconnect the function rod spring and the tape load arm wire from the tension arm unit. Remove the screw holding the slotted plate to the chassis and remove the slotted plate. Pass the tension arm roller through the aperture in the chassis at the slotted plate end of the slot. The tension arm unit can now be removed completely.

6.3.41 Removing Brake

Separate chassis from base (see Section 6.3.29). Remove the nut which holds the brake to the chassis, see Fig. 6.21. The brake can now be removed. N. B. When reassembling make sure that the "nose" engages correctly with the chassis.

6.3.42 Removing Front Cover

Remove the chassis from the base (see Section 6.3.29). Remove the two nuts which hold the front cover to the chassis, see Fig. 6.21, and slide off the springs and collars. Lift the front cover away from the chassis, unhooking the support at the same time.

SECTION 7
FAULT FINDING INFORMATION

7.1 DIAGNOSTIC CHART

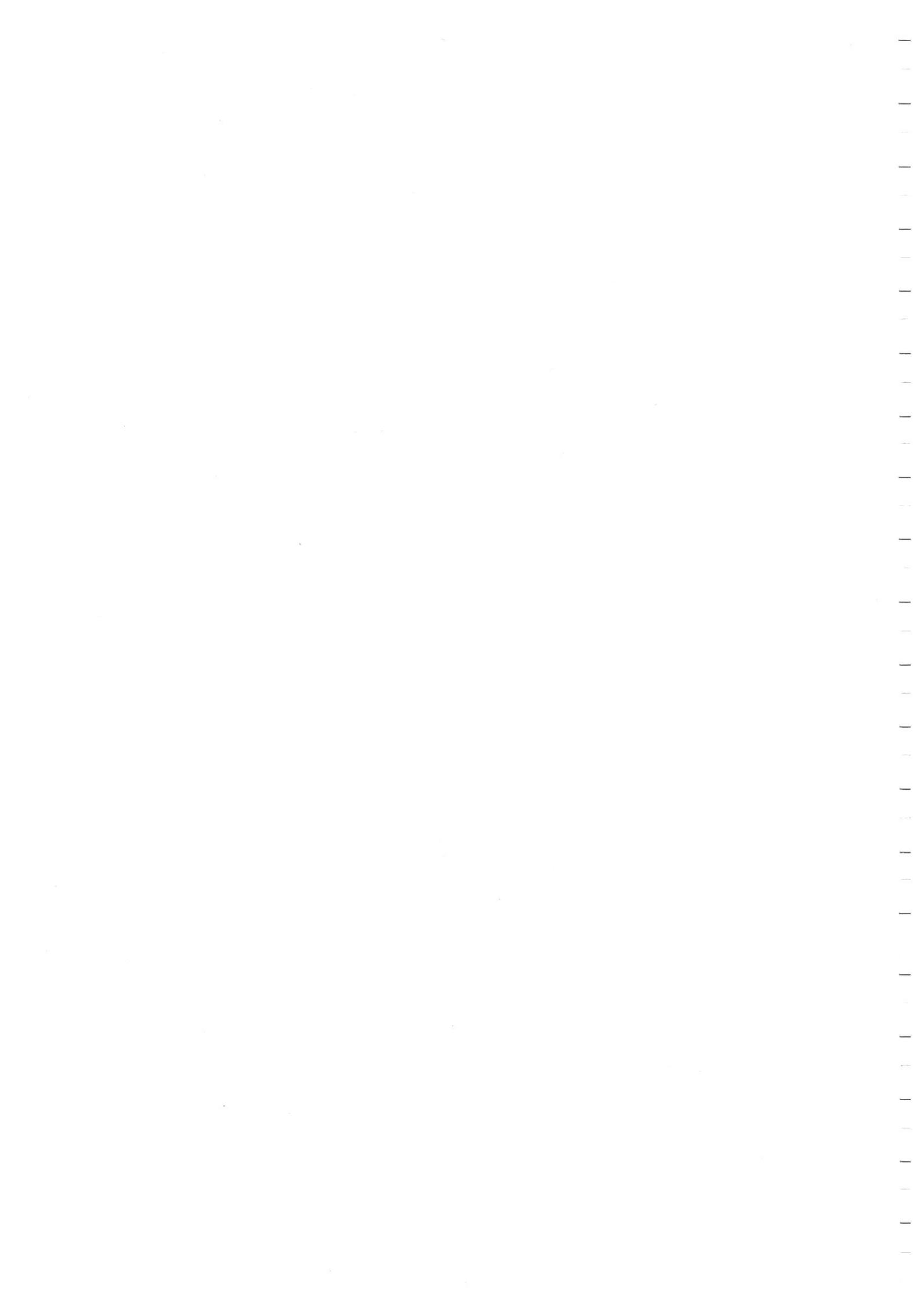
SYMPTOM	POSSIBLE CAUSE
<p>Punch motor is not heard to start when TAPE FEED is pressed.</p>	<ul style="list-style-type: none"> a) No a. c. power supply to punch station. b) POWER push-button not activated or defective. c) Fuse blown. d) Motor unit disconnected or defective. e) Punch mechanism blocked. f) Capstan pulley bearing extremely stiff. h) Logic p. c. b. defective. i) TAPE FEED push-button defective or disconnected.
<p>Punch mechanism continues to operate after TAPE FEED button is released.</p>	<ul style="list-style-type: none"> a) Logic p. c. b. defective. b) Data source interface defective, wrongly designed or wrongly operated. c) TAPE FEED push-button defective. d) <u>Punch defective:</u> <ul style="list-style-type: none"> - Clutch release mechanism out of adjustment. - Brake rings worn or greasy. - Stop position out of adjustment. - Timing contacts defective. - Cams out of adjustment. - 3-pronged driven part defective.
<p>Tape leader not generated when TAPE FEED button is pressed.</p>	<ul style="list-style-type: none"> a) Logic p. c. b. defective. b) Transformer unit defective. c) Punch unit data cable disconnected. d) TAPE FEED push-button disconnected. e) <u>Punch defective:</u> <ul style="list-style-type: none"> - Mechanism blocked. - Drive belt broken. - Drive belts or pulleys greasy. - Centrifugal clutch worn. - Start spring loose or broken. - Clutch magnet defective. - Clutch release mechanism defective or out of adjustment. - 3-pronged driven part defective.

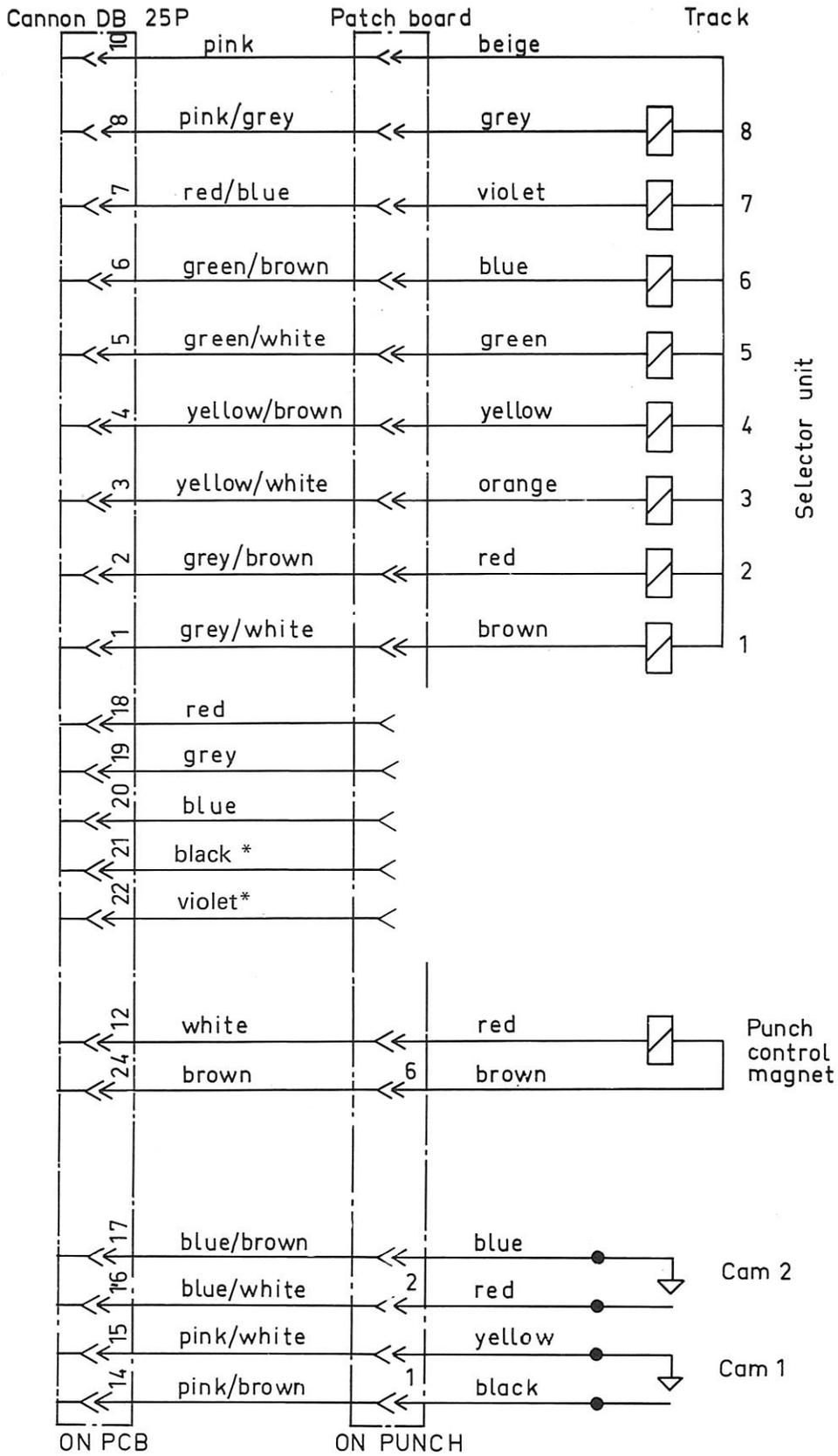
SYMPTOM	POSSIBLE CAUSE
Upper disc does not rotate.	a) Upper disc incorrectly positioned. b) Drive-belt broken. c) Interconnecting arm wrongly adjusted. d) Interconnection arm wrongly positioned (hooked up with guide box roller unit).
Upper disc rotates continuously and breaks tape.	a) Interconnecting arm wrongly adjusted. b) Tape guide box defective.
Too much tape being unwound from lower disc.	a) Brake incorrectly adjusted. b) Brake lining worn.
Tape-Error indicated.	a) Chad box needs emptying. b) Tape roll pressing against intermediate plate. c) Brake incorrectly adjusted. d) Chad sweeper function incorrectly adjusted. e) Lower disc bearings stiff. f) Micro-switch adjustment incorrect. g) Micro-switch defective. h) Logic p. c. b. defective.
Failure to indicate occurrence of Tape-Error.	a) Lamp blown. b) Micro-switch adjustment incorrect. c) Micro-switch defective or disconnected. d) Logic p. c. b. defective.
Feed holes damaged.	a) Interconnecting arm wrongly adjusted. b) Tape guide box defective. c) <u>Punch defective:</u> - U-bracket out of adjustment.
Incorrect pitch.	a) Tape incorrectly loaded. b) Lower disc dragging. c) <u>Punch defective:</u> - U-bracket out of adjustment. - Pitch adjustment incorrect.
Data from source not being punched or being erroneously punched.	a) Data source interface defective, wrongly designed or wrongly operated. b) Logic p. c. b. defective. c) <u>Punch defective:</u> - Punch set defective. - Timing contacts defective. - Cams out of adjustment. - Selector box defective or out of adjustment. - Punching bridge height incorrect.

SYMPTOM	POSSIBLE CAUSE
Punch operates sluggishly when TAPE FEED button is pressed.	a) Incorrect a. c. power supply. b) <u>Punch defective</u> : - Drive belts or pulleys greasy. - Centrifugal clutch worn. - Bearings defective. - Lubrication necessary.
Tape gets caught up inside guide box.	a) Tape quality not in accordance with Punch Station specification. b) Guide box defective.
Tape gets caught up behind visor.	a) Tape guide box position incorrectly adjusted. b) Track-duct adjustments incorrect.
Tape does not catch on to upper disc core and start winding up.	a) Top flange incorrectly positioned. b) Core non-standard. c) Tape quality not in accordance with Punch Station specification.
Tape tends to form cone on upper disc core.	a) Guide arm not contacting tape at top only.
Punch Station functions correctly but POWER lamp does not light up.	a) Lamp blown. b) Lamp disconnected.
Punched tape not being wound up fast enough.	a) Drive-wheel worn. b) Upper disc edge band worn.
Code holes not fully punched.	a) <u>Punch defective</u> : - Punching bridge height out of adjustment. - Punch set worn.
No feed holes.	a) <u>Punch defective</u> : - Selector box defective or out of adjustment. - Punching bridge height out of adjustment.
Parity check malfunctions.	a) Data source interface defective, wrongly designed or wrongly operated. b) Logic p. c. b. defective.

7.2 WIRING DIAGRAM

As an aid to trouble shooting, the punch to p. c. b. wiring diagram is shown in Fig. 7.3.





* Prior to Jan. 1978: brown/white
yellow/green

SECTION 8

SPARE PARTS LIST

Spare parts can be ordered from GNT or from our resellers. When ordering quote the number and name of the part and if possible the model and serial number of the relevant punch station or punch unit.

8.1 ESSENTIAL SPARES LIST

<u>Part No.</u>	<u>Name</u>
34/1692	Drive belt, flat, punch unit
34/60590	Core (TTS)
34/61500	Drive-wheel
34/61600	Top flange
MJ8-51833	Capstan pulley drive belt
MJ8-51832	Round-sectioned drive belt, punch unit
MY2-52272	Fuse, 0.5 A (220/240 V)
MY2-51754	Fuse, 1.25 A (100/115 V)
MY2-51766	Indicator lamp
MY7-51674	Core (8-hole)
MZ7-51380	Micro-switch

8.2 RECOMMENDED SPARES LIST

<u>Part No.</u>	<u>Name</u>
*34/1606	Centrifugal clutch unit, 70 char./s, 50 Hz
*34/1607	Centrifugal clutch unit, 70 char./s, 60 Hz
*34/1608	Centrifugal clutch unit, 40 char./s, 50 Hz
*34/1609	Centrifugal clutch unit, 40 char./s, 60 Hz
*34/1670	Clutch, driven part
34/1692	Drive belt, flat, punch unit
*34/1702	Punch set, unit (8 hole)
*34/1703	Punch set, unit (TTS)
*34/1786	Bushing for resetting
*34/1788	Start spring
*34/1842	Transport head (8 hole)
*34/1843	Transport head (TTS)
*34/1845	Flat spring
*34/1852	U-bracket
*34/1904	Clutch magnet, 24 V
*34/1950	Bracket
*34/1963	Clutch lever
*34/1966	Spring for 34/1963
*34/1982	Brake ring, outer
*34/1986	Brake ring, inner
*34/2202	Selector unit, 24 V
*34/2400	Timing contacts, unit

<u>Part No.</u>	<u>Name</u>
34/67110	Interface p. c. b.
34/60590	Core (TTS)
34/60670	Upper disc edge band
34/60670	Upper disc edge band
34/61500	Drive-wheel
34/61600	Top flange
34/62370	Tape guide box
*34/66110	Motor unit, 240 V, 50 Hz
*34/66120	Motor unit, 220 V, 50 Hz
*34/66130	Motor unit, 115 V, 60 Hz
*34/66150	Motor unit, 100 V, 50 Hz
*34/66160	Motor unit, 100 V, 60 Hz
MJ8-51833	Capstan pulley drive belt
MJ8-51832	Round-sectioned drive belt, punch unit
MY2-52272	Fuse, 0.5 A (220/240 V)
MY2-51754	Fuse, 1.25 A (100/115 V)
MY7-51674	Core (8-hole)
34/67330	Control panel set
34/65010	Punch unit, 40 char./s, 240 V, 50 Hz, 8 hole
34/65020	Punch unit, 40 char./s, 240 V, 50 Hz, TTS
34/65050	Punch unit, 40 char./s, 220 V, 50 Hz, 8 hole
34/65060	Punch unit, 40 char./s, 220 V, 50 Hz, TTS
34/65090	Punch unit, 40 char./s, 115 V, 60 Hz, 8 hole
34/65100	Punch unit, 40 char./s, 115 V, 60 Hz, TTS
34/65130	Punch unit, 40 char./s, 100 V, 50 Hz, 8 hole
34/65170	Punch unit, 40 char./s, 100 V, 60 Hz, 8 hole
34/65510	Punch unit, 70 char./s, 240 V, 50 Hz, 8 hole
34/65520	Punch unit, 70 char./s, 240 V, 50 Hz, TTS
34/65550	Punch unit, 70 char./s, 220 V, 50 Hz, 8 hole
34/65560	Punch unit, 70 char./s, 220 V, 50 Hz, TTS
34/65590	Punch unit, 70 char./s, 115 V, 60 Hz, 8 hole
34/65600	Punch unit, 70 char./s, 115 V, 60 Hz, TTS
34/65630	Punch unit, 70 char./s, 100 V, 50 Hz, 8 hole
34/65670	Punch unit, 70 char./s, 100 V, 60 Hz, 8 hole

N.B. The spares marked * are parts of the punch units. They will thus not be needed where the repair policy is to replace the complete punch unit. Where the opposite policy applies, the punch units listed at the end of the table will of course not be needed. In all cases the parts stocked should of course relate to the specifications of the punch stations being maintained.

8.3 COMPLETE SPARES LIST

Diagram Reference Number	Part No.	Part Name
1	34/60500	Plate support
2	34/60510	Eccentric support
3	34/60520	Stop block
4	34/60530	Screw and tube
5	34/60560	Felt pad
6	34/60620	Lower disc
7	34/60660	Core clip
8	34/60670	Upper disc edge band
9	34/61040	Lock spring
10	34/61050	Chad box lock
10a	34/61520	Interconnecting arm guide
11	34/61060	Release button
12	34/61550	Upper disc
13	34/61600	Top flange
14	34/62750	Front cover
15	34/62800	Cover rod
16	34/62810	Hinge rod
17	34/62820	Tube
18	34/62830	Hinge spring
19	34/62850	Cover support
20	34/62860	Angle plate
21	34/63010	Side spring
22	MY7-51674	Core (8-hole)
22	34/60590	Core (TTS)
23	MY7-51748	A. C. power connector

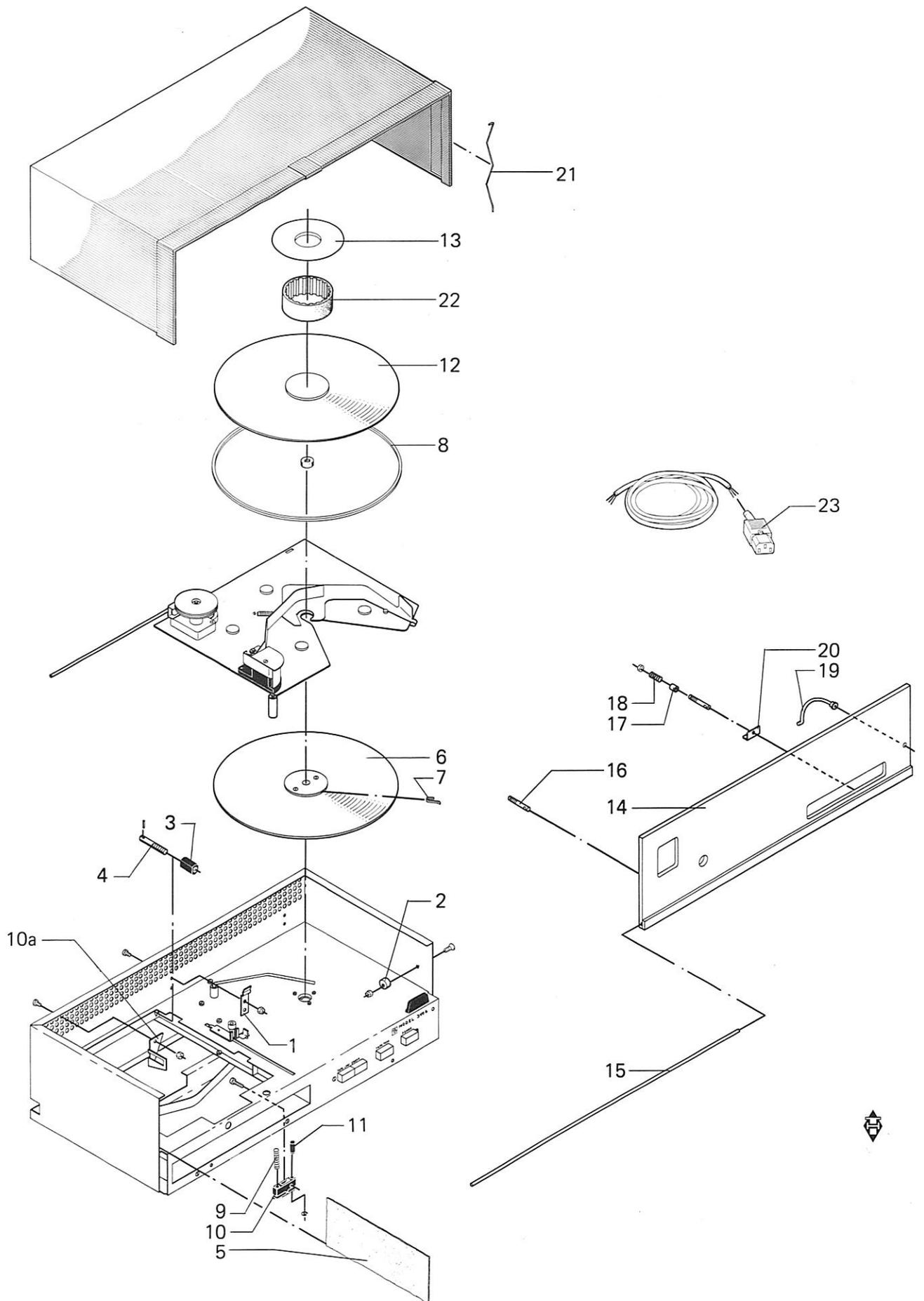


Diagram
Reference
Number

Part No.

Part Name

1	34/60140	Clamp bracket
2	34/61120	Chad box spring
3	34/61140	Chad box
4	34/61820	Release arm
5	34/62370	Tape guide box
6	34/65010	Punch unit, 40 char./s, 240 V, 50 Hz, 8 hole
6	34/65020	Punch unit, 40 char./s, 240 V, 50 Hz, TTS
6	34/65050	Punch unit, 40 char./s, 220 V, 50 Hz, 8 hole
6	34/65060	Punch unit, 40 char./s, 220 V, 50 Hz, TTS
6	34/65090	Punch unit, 40 char./s, 115 V, 60 Hz, 8 hole
6	34/65100	Punch unit, 40 char./s, 115 V, 60 Hz, TTS
6	34/65130	Punch unit, 40 char./s, 100 V, 50 Hz, 8 hole
6	34/65170	Punch unit, 40 char./s, 100 V, 60 Hz, 8 hole
6	34/65510	Punch unit, 70 char./s, 240 V, 50 Hz, 8 hole
6	34/65520	Punch unit, 70 char./s, 240 V, 50 Hz, TTS
6	34/65550	Punch unit, 70 char./s, 220 V, 50 Hz, 8 hole
6	34/65560	Punch unit, 70 char./s, 220 V, 50 Hz, TTS
6	34/65590	Punch unit, 70 char./s, 115 V, 60 Hz, 8 hole
6	34/65600	Punch unit, 70 char./s, 115 V, 60 Hz, TTS
6	34/65630	Punch unit, 70 char./s, 100 V, 50 Hz, 8 hole
6	34/65670	Punch unit, 70 char./s, 100 V, 60 Hz, 8 hole
7	MJ8-51833	Capstan pulley drive belt

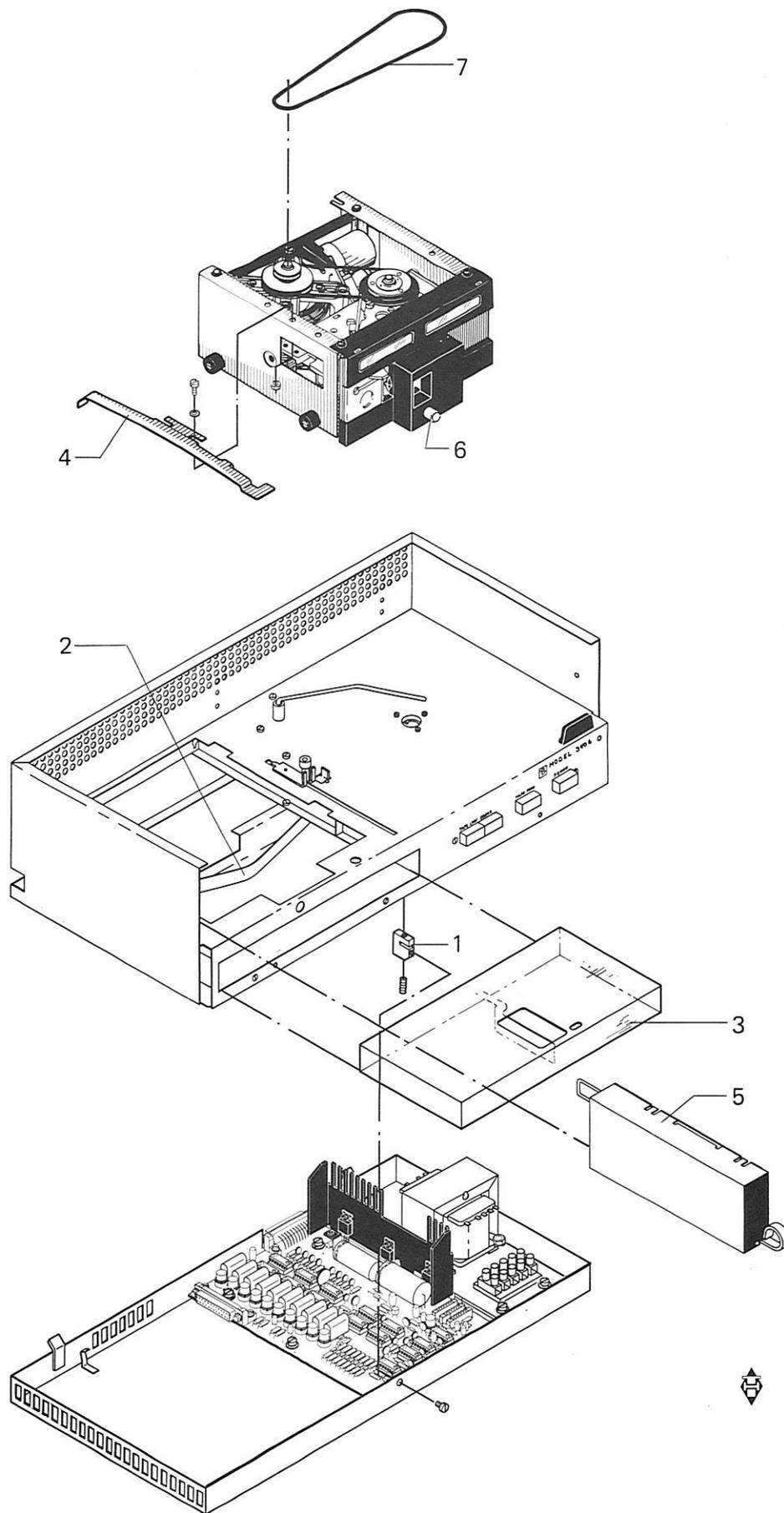


Diagram
Reference
Number

Part No.

Part Name

1	34/1618	Washer, fibre
2	34/61240	Intermediate plate
3	34/61300	Release lever
4	34/61320	Release lever spring
5	34/61340	Capstan housing
6	34/61370	Rocking arm
7	34/61380	Rocking arm spring
8	34/61400	Crank arm
9	34/61440	Clamping boss
10	34/61450	Interconnecting arm
11	34/61460	Capstan
12	34/61490	Capstan pulley
13	34/61500	Drive-wheel
14	34/61650	Duct base
15	34/61660	Pin
16	34/61700	Guide arm stop
17	34/61730	Duct side
18	34/61740	Duct top
19	34/61750	Guide arm
20	34/61760	Guide arm spring
21	34/61790	Roller axle
22	34/61800	Lower roller

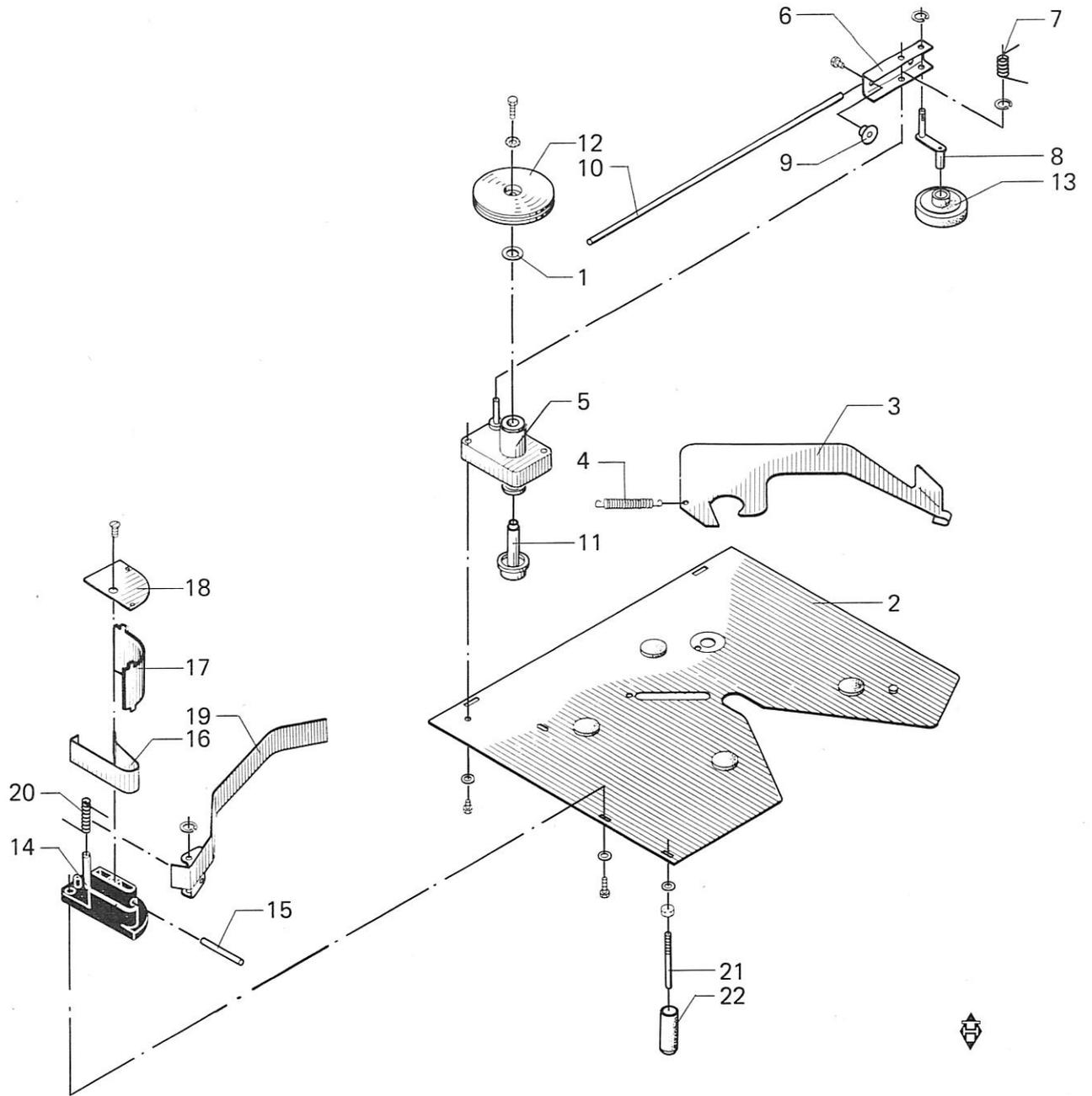


Diagram
Reference
Number

Diagram Reference Number	Part No.	Part Name
1	34/1674	Ball bearing
2	34/51520	Slide boss
3	34/51530	Slide
4	34/60240	Stop wire
5	34/60250	Spring for tape-low
6	34/60270	Function rod
7	34/60600	Bearing housing
8	34/60610	Bearing pin
9	34/60680	Rod pivot
10	34/60700	Connecting rod
11	34/60720	Boss
12	34/60760	Tension arm unit
13	34/60850	Tension arm spring
14	34/60860	Slotted plate
15	34/60870	Tape load arm
16	34/60890	Conical spring
17	34/60900	Cover plate
18	34/60910	Wire pivot
19	34/60920	Load wire
20	34/60950	Brake
21	34/60980	Brake pivot
22	34/61100	Retaining spring
23	34/61110	Connecting rod support
24	34/67330	Control panel set
25	42/14560	Tape-low cam
26	42/14750	Tape-low arm
27	MY2-51725	Fuse, 0.5 A (220/240 V)
27	MY2-51754	Fuse, 1.25 A (100/115 V)
28	MY2-51766	Indicator lamp
29	MZ7-51380	Micro-switch
30	MY7-51681	A. C. Power receptacle

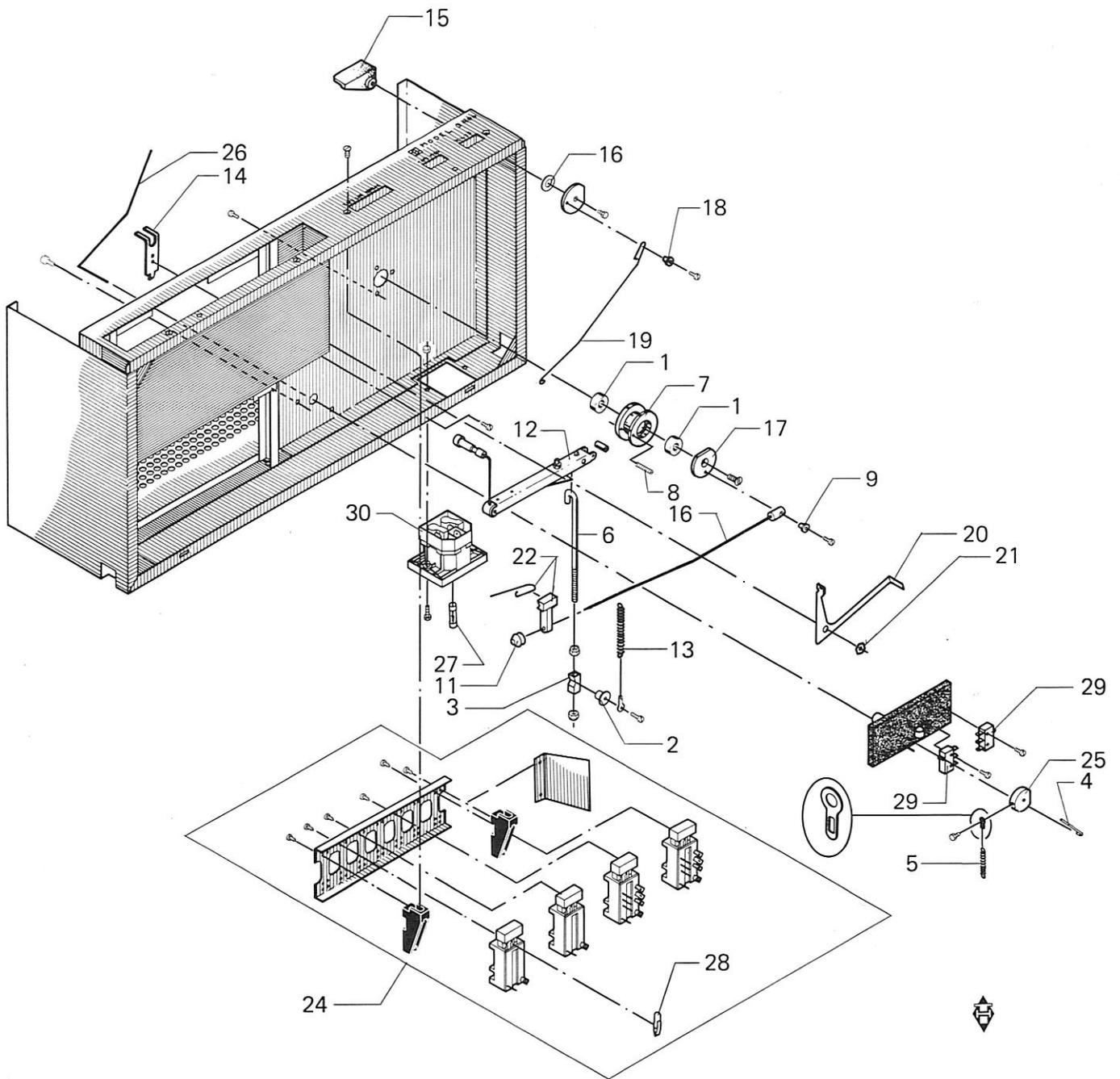


Diagram
Reference

Number	Part No.	Part Name
1	34/60050	Rubber foot
3	34/67110	Interface p. c. b.
4	34/60340	Heat conductor
5	MY1-52332	Transformer (110/115 V)
5	MY1-52333	Transformer (220/240 V)

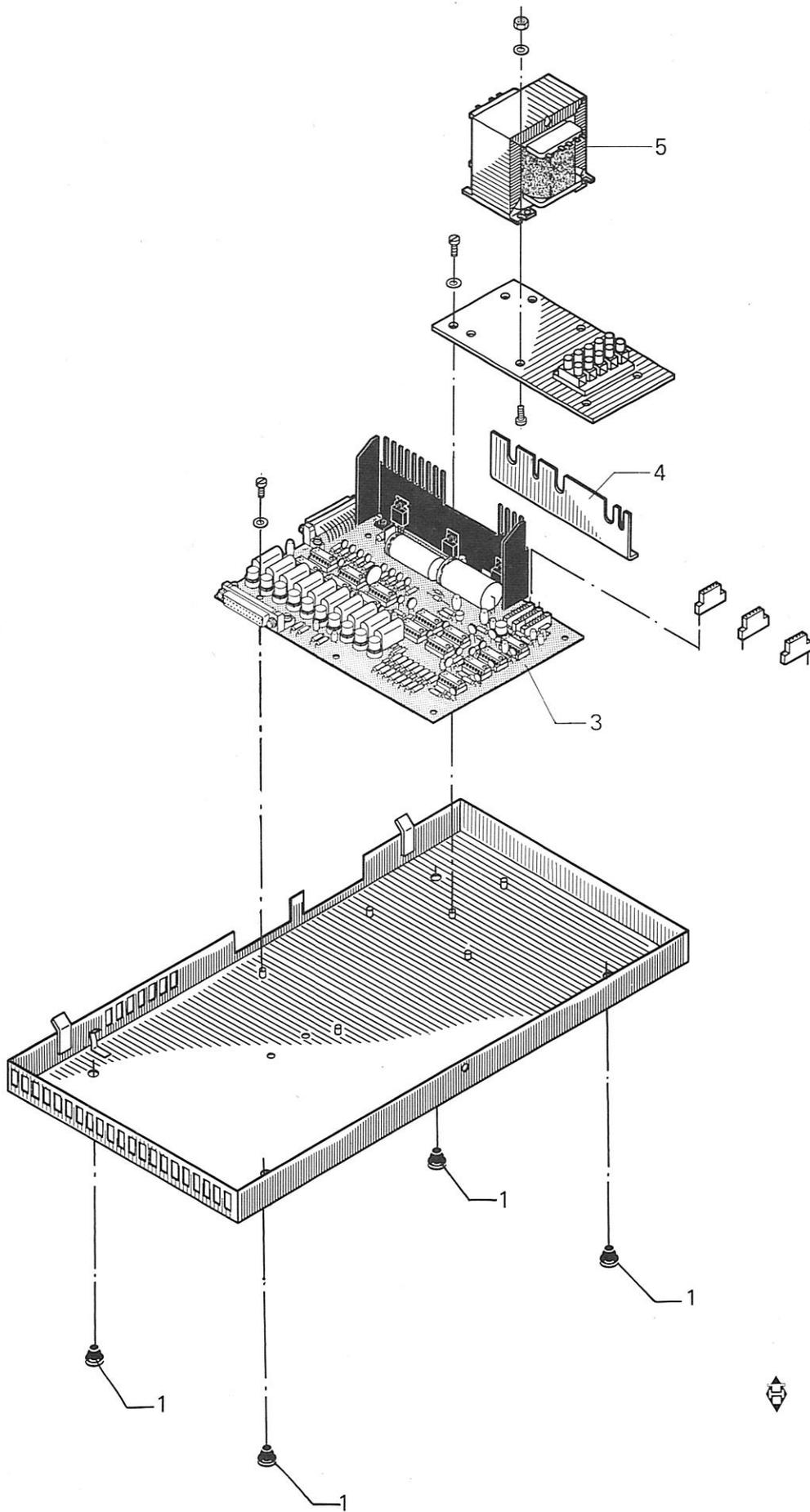


Diagram
Reference

Number	Part No.	Part Name
1	34/61850	Cabinet
2	34/61890	Insert
3	34/61900	Rubber support
4	34/61950	Locking rod
5	34/61990	Rubber moulding
6	34/62060	Motor pulley 70 char./s. 50 Hz
6	34/62070	Motor pulley 70 char./s. 60 Hz
6	34/62080	Motor pulley 40 char./s. 50 Hz
6	34/62090	Motor pulley 40 char./s. 60 Hz
6a	34/62160	Fastening rod (included with motor unit)
7	34/66110	Motor unit, 240 V, 50 Hz
7	34/66120	Motor unit, 220 V, 50 Hz
7	34/66130	Motor unit, 115 V, 60 Hz
7	34/66140	Motor unit, 115 V, 50 Hz
7	34/66150	Motor unit, 100 V, 50 Hz
7	34/66160	Motor unit, 100 V, 60 Hz
8	MJ8-51832	Round-sectioned drive belt, punch unit

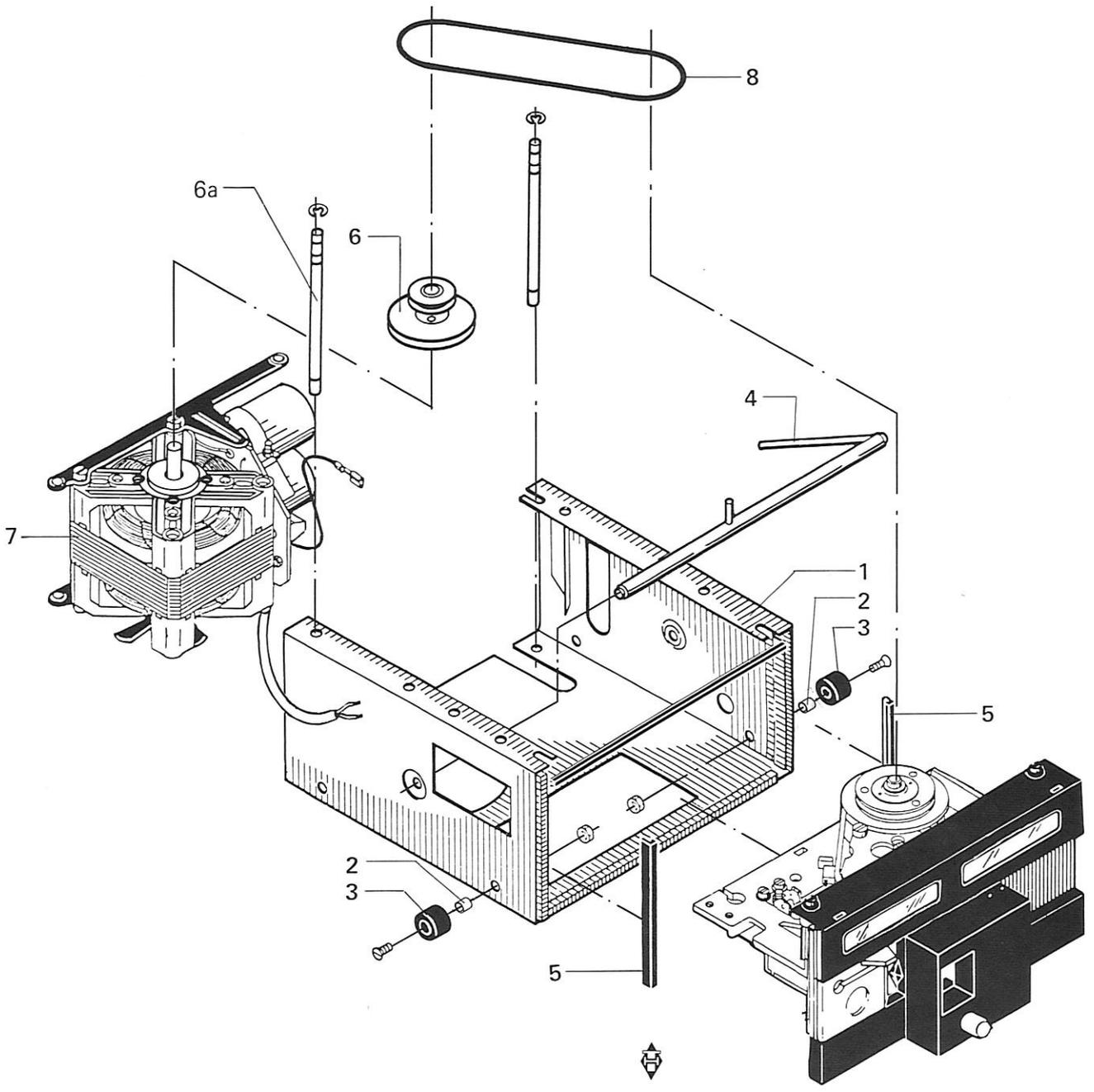


Diagram
Reference

Number	Part No.	Part Name
1	34/2116	Tape release arm
2	34/2118	Spring for 34/2116
3	34/62200	Tape latch unit
3	34/62550	Tape latch unit, TTS
4	34/62210	Chad chute
5	34/62240	Selector box
6	34/62290	Visor panel
7	34/62300	Visor
8	34/62310	Fastening studs
9	34/62350	Flap

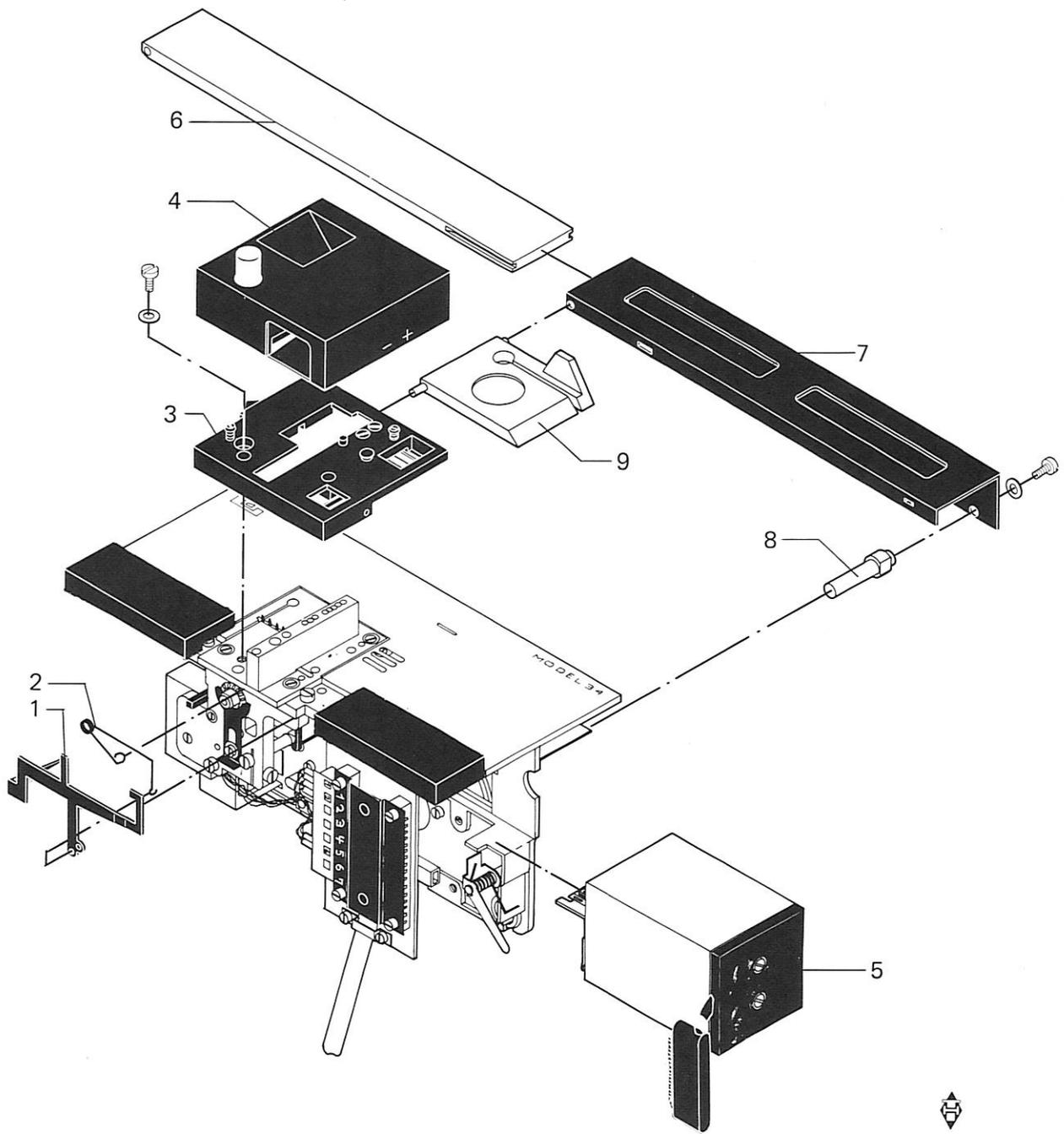


Diagram Reference Number	Part No.	Part Name
1	34/1524	Cable duct
2	34/1904	Clutch magnet, 24 V
3	34/1950	Bracket, clutch release mechanism, unit
4	34/2400	Timing contacts, unit
5	34/62250	Patch board with cable and plug
6	34/62320	Leaf spring
6	34/62340	Leaf spring, TTS

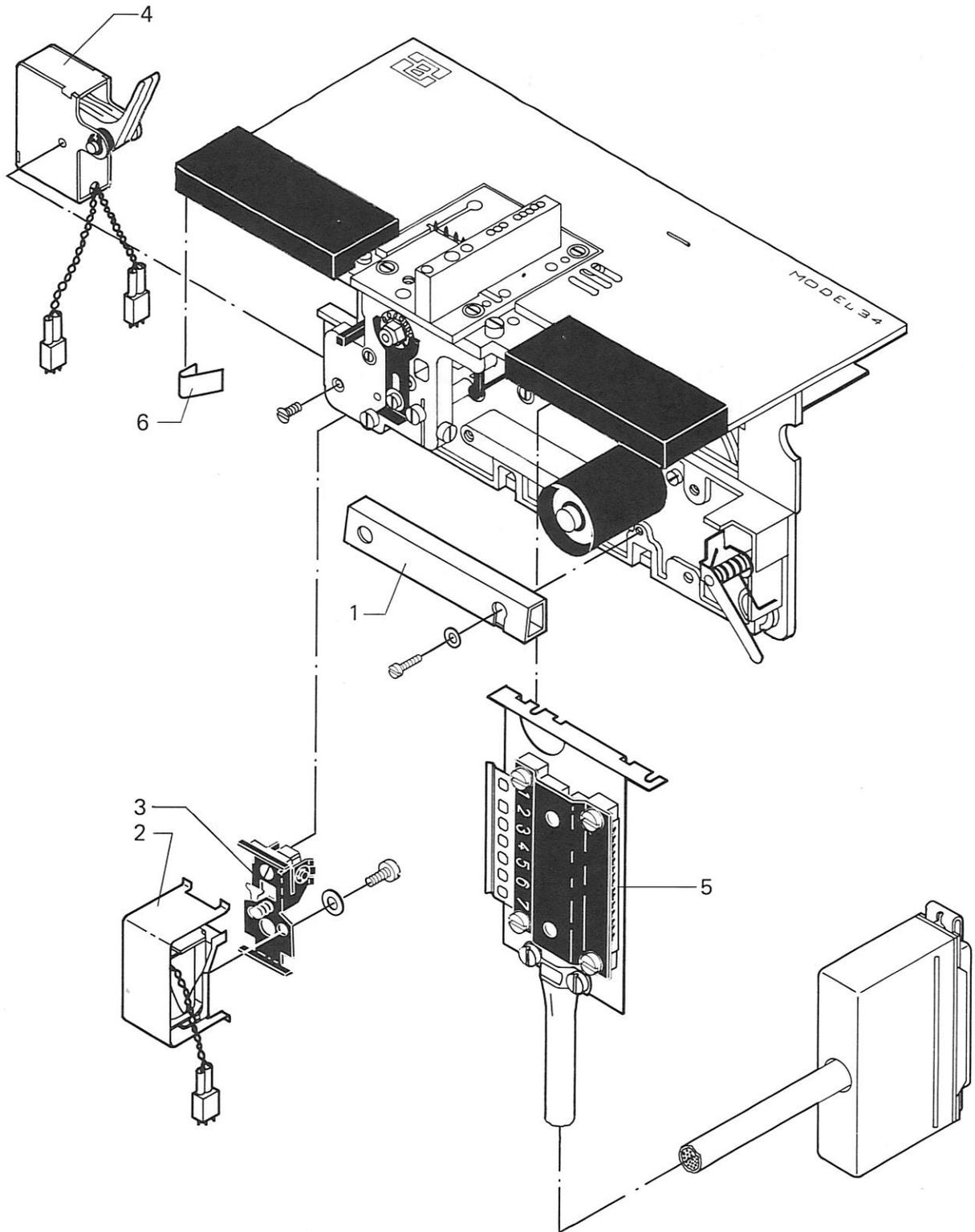


Diagram
Reference

Number	Part No.	Part Name
1	34/1527	Lock for selector box
2	34/1528	Spring for 34/1527
2a	34/1536	Aluminium plate
3	34/1562	Guide rail, right
3	34/1567	Guide rail, right, TTS
4	34/1702	Punch set, unit
4	34/1703	Punch set, unit, TTS
5	34/1752	Main shaft, unit
6	34/1769	Y-clamp
7	34/1782	Connecting rod
8	34/1785	Pin for 34/1782
9	34/1786	Reset bushing
10	34/1788	Start spring
11	34/1792	Rocker arm
12	34/1794	Eccentric shaft for 34/1792
13	34/1814	Punching bridge shaft
14	34/1842	Transport head
14	34/1843	Transport head, TTS
15	34/1845	Flat spring for 34/1842
16	34/1852	U-bracket
17	34/1855	Bearing for 34/1852
18	34/62280	Guide rail, left
18	34/62270	Guide rail, left, TTS

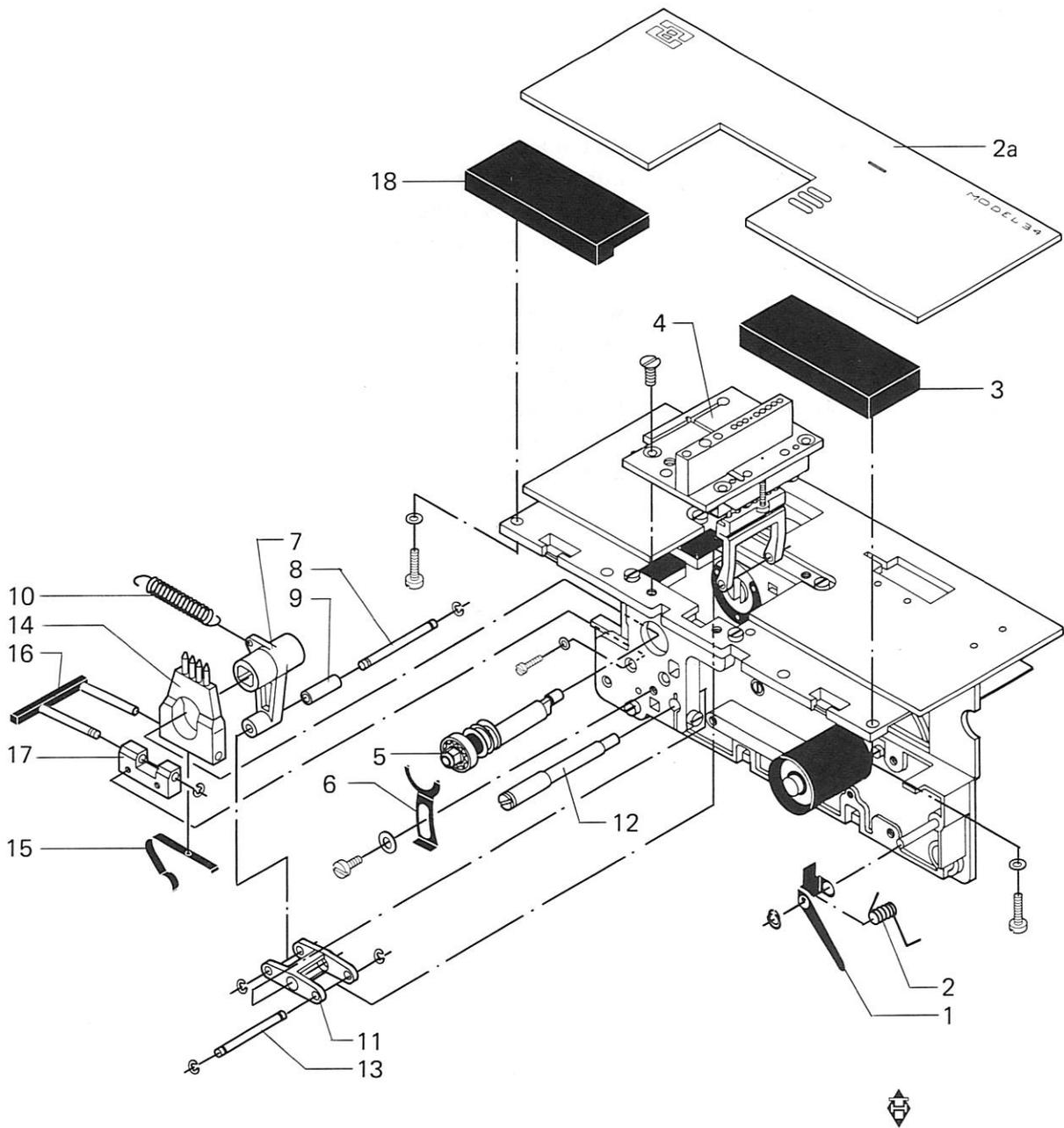
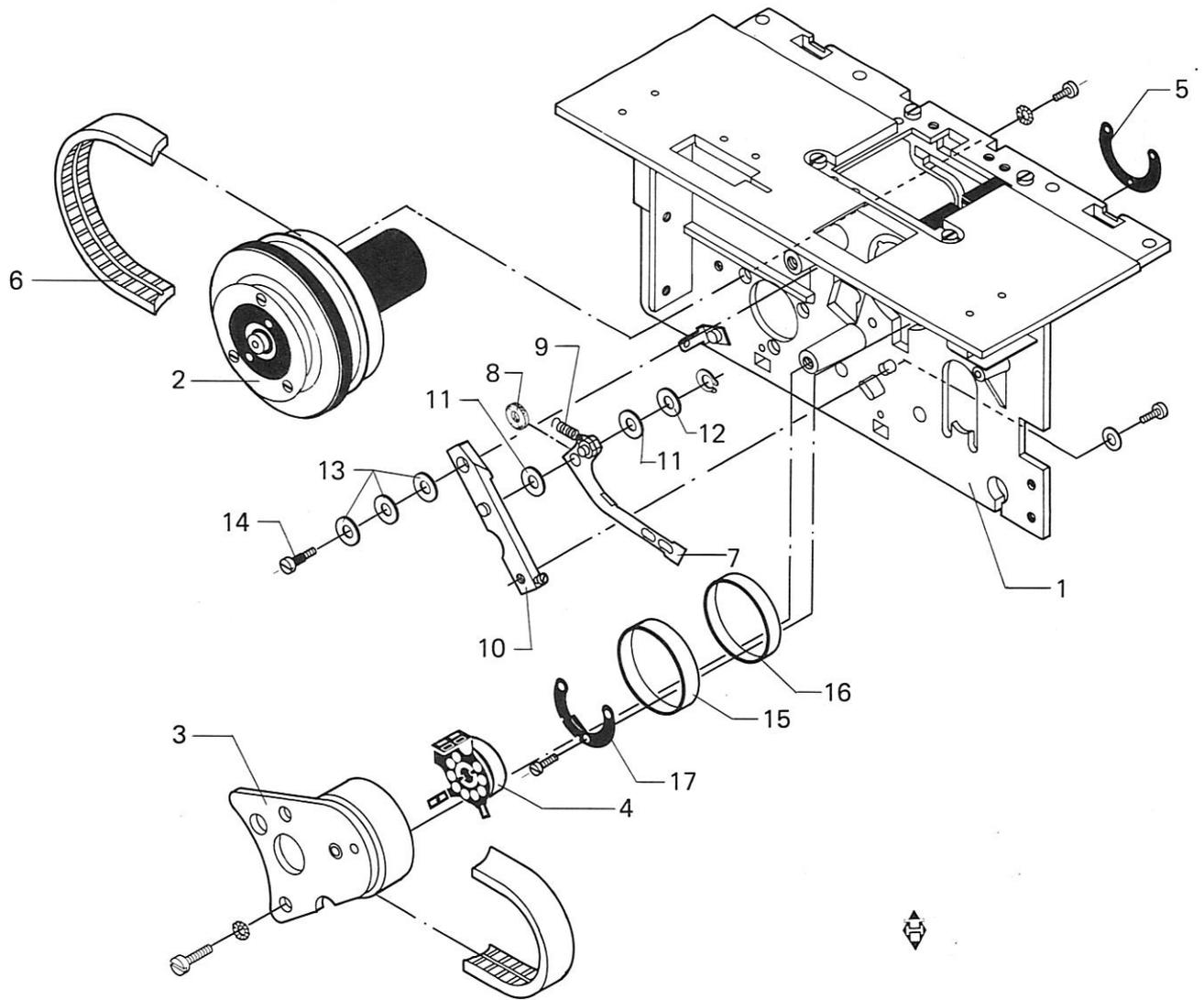
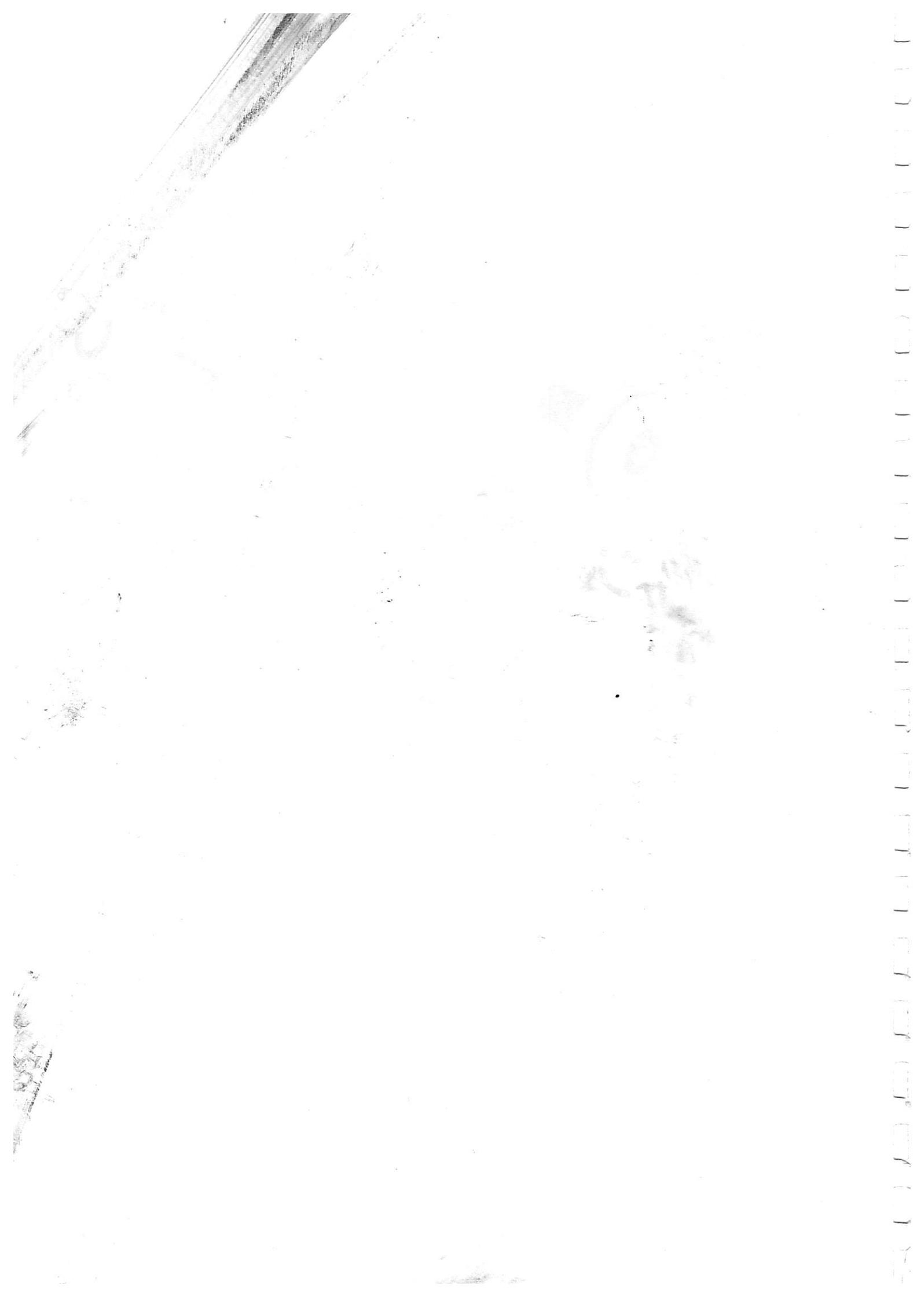
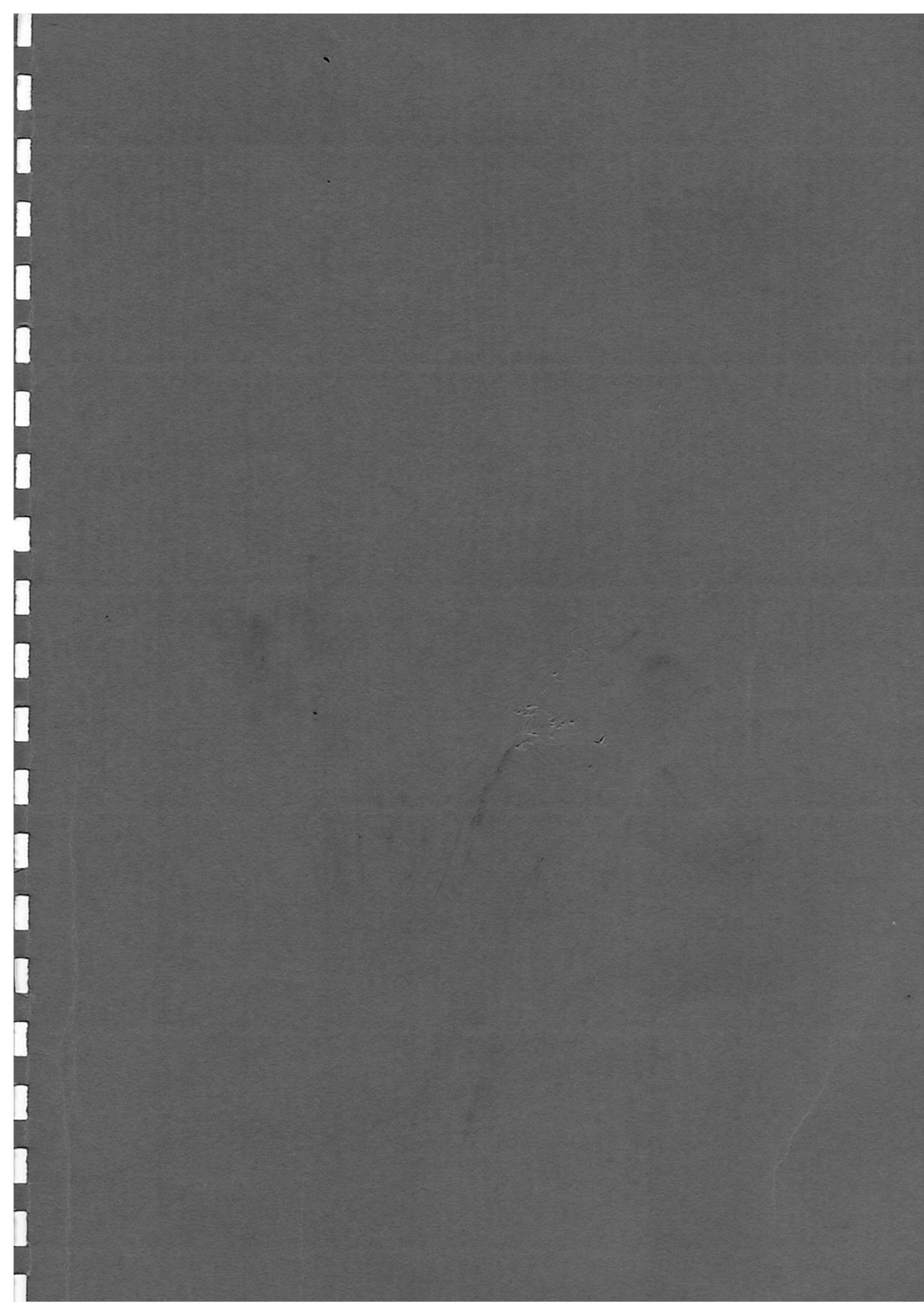


Diagram
Reference

Number	Part No.	Part Name
1	34/1511	Chassis
2	34/1606	Centrifugal clutch, unit, 70 char./s, 50 Hz
2	34/1607	Centrifugal clutch, unit, 70 char./s, 60 Hz
2	34/1608	Centrifugal clutch, unit, 40 char./s, 50 Hz
2	34/1609	Centrifugal clutch, unit, 40 char./s, 60 Hz
3	34/1652	Guide plate with pulley
4	34/1670	Clutch, 3-pronged driven part
5	34/1678	Ball bearing retainer
6	34/1692	Drive belt, flat
7	34/1963	Clutch lever
8	34/1965	Lubrication felt
9	34/1966	Spring for 34/1963
10	34/1972	Support arm for 34/1963
11	34/1973	Washer (2)
12	34/1975	Washer, fibre
13	34/1976	Spring washer (3)
14	34/1978	Shoulder screw
15	34/1982	Brake ring, outer
16	34/1986	Brake ring, inner.
17	34/1987	Support ring







UNITED KINGDOM: GNT AUTOMATIC (UK) LIMITED
SUFFOLK HOUSE . HIGH STREET . SUNNINGDALE . BERKSHIRE SL5 ONF
PHONE: 990 26156/58 . TELEX: 84 75 84

DEUTSCHLAND: GNT AUTOMATIC DATENGERÄTE GmbH
D-8 MÜNCHEN 22 . KÖNIGINSTRASSE 25
TELEFON: (089) 28 70 77 UND 28 70 78 . TELEX: 52 43 78

FRANCE: GNT AUTOMATIC FRANCE
62, RUE DU MARÉCHAL FOCH . 78 000 VERSAILLES
TÉL: (3) 950 28 97 . TELEX: 69 62 61

USA: GNT AUTOMATIC
1560, TRAPELO ROAD . WALTHAM . MASS. 0 21 54
PHONE: (617) 890 3305 . TELEX: 92 33 18



CORPORATE HEADQUARTERS . DENMARK
GNT AUTOMATIC A/S . 6, TELEFONVEJ
DK-2860 SOEBORG . PHONE: (01) 69 51 88 . TELEX: 2 70 64