

No. E-3121a

Service instructions
for keyboard unit B-52

Edition July 1961

EXND
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E-3121a

Important

When overhauling machines from No. 6501 up, be sure to exchange the following electrical parts (if they are not already installed):

- 1) Transistor OC-76 replace by OC-80
- 2) Resistor 220 Ω replace by 1 to 1,5 K Ω
- 3) Thermistor (Pos.14) replace by resistor 20 to 30 Ω

(see diagrams S 404 214 & S 404 215 for correct placement)

Zug, 29th June 1961
OSt/gs



CRYPTO AG. ZUG

(Switzerland - Suisse)

No. E-3121a

Service Instructions for Keyboard unit B-52

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Service Instructions for Keyboard Unit B-52

For machines up to no. 6999

The parts numbers mentioned are those used in the spare parts catalogue L-027 or L-052 of a standard machine with 26-letter-alphabets. Pieces marked in ()-brackets are parts for early-series machines. Main parts are also marked in the pictures in this instruction booklet.

During the manufacture of early-series B-52 machines a number of modifications have been made. If your machine is to be overhauled, use new modified parts to replace the old ones, where needed. Be sure to have lubricants as per page 22 on stock.

New parts:

Replaced parts:

1	Drum drive shaft without pin holes	408 730	Drilled shaft	408 730
1	Cam unit with 2 screws	408 538 408 545	Cam unit with pin holes	408 538
3	Release springs	409 237	Springs	409 226
2	Spring retainer	408 768	Replace bolts on both ratchet wheel collets break off these bolts	408 579
1	Ratchet ring	408 582	Grind away eventual protruding nose [see fig.13]	
1	Magnet support with two tapped holes for oil baffle	408 626	Magnet support without holes	408 626

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New parts:

Replaced parts:

1	Oil baffle	408 874	--	
2	Screws cyl.	M 3x3	--	
1	Toothed scanning disk	408 602	Plain scanning disk (only for machines from 6501 up)	408 853
2	Screws cyl.	M2,3x16*		
2	Distance tubes	408 937*		
2	Nuts	M 2,3 *		
2	Spring washers	2,2/4,5*	*) only for machines from no. 6501 up.	
1	Square washer	408 727*		
1	Ratchet spring	408 936*		
1	Rubber washer	408 888	Tripod spring	407 161
2	Rubber washers to be placed under the two upper screws of main hood and	408 785		
2	Washers fixing screw of main hood	5,3/12		
1	Damper lever with manual release bolt	408 637	Lever without manual release bolt	408 637
1	Main bearing plate	208 501		
	place a longitudinal hole near the keyboard to fit the bolt of lever 408 637, ask for drawing 208 501			
3	Fuses 3A	EN 08524	Motor and spare fuses 1,8 A	EN 08520
1	Set release knob system catalogue L-027 page 37a Fit in hood, ask for drawing 208 780 to drill holes.			

A) Dismounting the unit

Note: It is advisable to put the different springs in marked containers, to facilitate reassembling.

1) General

Disconnect mains and battery cable

Unscrew sidecover 208 780 [3 screws, fig.1]

Unscrew bottom plate 408 779 [6 screws, fig.2]

Unscrew modifier plate [if any] [3 screws, fig.3]

let it be caught by its wire harness

Unscrew scanning disk 408 853 and ratchet spring (or cam contact EN 07059) [fig.3]

Take care not to damage the fine wire brushes on the scanning disk!

Note: Machines no. 6101 to 6400 have a cam contact; some of the machines no. 6501 to 6999 are fitted with a toothed scanning disk and ratchet spring 408 936 or with a plain scanning disk and no ratchet spring. For replacement, a toothed disk 408 603 and spring 408 936 shall be used.

Unsolder the red-blue and red-black wires at the releasing magnet EN 10 009 [fig.4]

Unscrew control rod 408 717 after having removed the Benzing clip [fig.4]. Do the same with control rod 408 721.

Remove clip from bolt 408 630, take away damper unit 408 751 and control lever 408 631 [fig.4]

Unscrew the transformer screw which holds the cable clamp 408 777 [fig.2] and the keyboard-frame-unit 208 650 [2 screws, fig.4]. Lift carefully out the keyboard-frame, avoiding damage to the wires and unscrew the contact row EN 07058. [2 screws, fig.5]

Unscrew bearing plate 408 594 and bend it away, taking care not to damage the fixed collector with its cable [fig.6].

Remove clip on gearwheel 408 871 (408 515) [fig. 6] and pull it off.

Remove baffle plate 408 874 fixed with two screws at the magnet support 408 626. [fig.2] (Not found in early type of machines.)

Pull carefully on the knurled nut 408 569 until it disengages from its locking pin and unscrew it at this position until spring 408 572 can be released. [fig.4]

Hold the armature 407 160 [fig.4] with the wrench 408 847 from the screw side and unscrew carefully the spherical head screw 407 162. [Take care not to damage the highly polished front side of the armature, as well as of the magnet EH 10 009, it is advisable to release the armature from the magnet for this operation]

Loosen screw[s] M3x10 on the side of the magnet support and remove the magnet EH 10 009.

Disengage spring 408 549 and pull off locking arm 408 559 [fig.4]

2) Typewheel driving shaft

Disengage spring 409 237 (409 226) [Fig.4]

Loosen both screws 408 591 and pull off the tightly-fitted hub (nave) 408 588.

Pull off outer drive spring 409 225 [fig.7], ratchet wheel 408 587 [together with its collet 408 579] collet 408 583, inner drive spring 409 225, ratchet wheel 408 582 [together with its collet 408 579] and toothwheel 408 575.

After this the shaft 408 758 is carefully pulled out of the bearing 408 573 [towards the opposite side] [fig.1]

Disengage spring 408 612 [fig.8] and pull away release lever 408 556

3) Miscellaneousness

Unscrew plate 408 505 [fig.1], support 408 626 [fig.4], support 308 615 [fig.8] and pull off reflex lever 408 552 as well as intermediale gear wheel 408 551 [fig.8]. Pull off gear wheels 408 871 [fig.4] and 408 873 (408 530) [fig.8]

4) Drum driving shaft

Loosen screws (or pin in early machines) of cam units 408 542 and 408 538 [fig.6, 9] and pull these off [they are tightly fixed].

Loosen both screws 408 591 [fig.6] and pull off hub (nave) 408 588, drive spring 409 225, locking cam 408 537 with its collet 408 579 [fig.9] and gear wheel 408 533.

5) Motor

Unscrew the motor wires at the solder tag terminal L [fig.2]

Unscrew the four motor screws L 4x8 and remove the motor.

6) Keyboard

Disengage both springs 408 702 [fig.10] one spring 408 655 and spring 408 698.

Dismount right hand suspension 408 695 [two screws] and take away both guides 308 688 and 308 679. [Take care of the adjusting washers, they must be put back later on exactly as they have been].

Remove four screws 408 657 [fig.10] and take away with care, cage 408 668 with the 29 interlock disks (pulleys) 408 667. [fig.5]

B) Cleaning

All metal parts shall be cleaned in a non corroding detergent i.e. light Gasoline, Benzol etc. They shall be lubricated during the reassembling, according to the instructions.

Caution: Use the exact lubricants marked for each part, to avoid improper function - this is especially important for the spring-clutches! See list of lubricants on page 22.

C) Reassambling

1) Keyboard

Put all 29 disks (pulleys) 408 667 in a small container with some lubricant powder no. CAG 21, brush the powder into their surfaces one by one, with a piece of cloth or an old tooth-brush and lay them into the cage 408 668 [fig.5]

Fasten this cage [with the 29 disks (pulleys) in] on to the guide 408 665 with the four screws 408 657. [fig.10]

Try to actuate the keys, one by one, they must move without jamming, and only one key at the time shall be free to be depressed - the disks (pulleys) lock the other to do so.

Blow away excessive lubricating powder.

Lubricate each of the bearing bolts of the guides 306 688 and 308 679 with two drops of graphite-oil no. CAG 12.

The ratchets, as well as the V-shaped bars are to be lubricated with grease no. CAG 32.

Push these guides into the left hand suspension 408 695, adjust the right hand suspension on to the guides and fasten the whole with two screws L 3x8 on to the guide 308 665 [fig. 10] [Do not forget the distance washers].

Hook on the two springs 408 702 and the spring 408 698 and 408 655 [fig.10].

Adjust the axial clearance of the two guides 306 688 and 308 679 to 0,1 to 0,2 mm by moving the suspension 408 695, then tighten its screws securely.

If one of the keys has been locked in its depressed position, release it by tilting the upper guide 308 679. Then depress one key and the nose of its lever 408 669 [670/673/674/675/676] shall pass the upper guide with a clearance of 0,1 mm [fig.11], and shall tilt away the lower guide 308 688, which, on the right side releases ratchet 408 703 with its long lever. Under the tension of the spring 408 698 the upper guide 308 679 falls in. In the depressed position the nose of the key shall have an overstrike clearance of 0,1 to 0,2 mm with regard to the V-shaped bar of the guide. [fig.11] Also, in depressed position, the ratchet 408 703 shall have an overstrike of 0,1 mm against the side plate of the guide 308 679 [Fig.11].

Check this with all keys.

The left locking arm 408 699 has the function of following one key down and tilt the upper guide 308 679. The arm shall lock in under the tension of its spring 408 702, to hold the guide 308 679 tilted out. If the key is now released slowly, the lower guide 308 688 falls in and tilts the locking arm out.

In this position the locking arm 408 699 shall have an overstrike of min. 0,1 mm against the left side plate of the upper guide 308 679.

Adjustments

- a) The clearance between the lug-nose and the guide 308 679 is too small: Adjust by adding washers under the suspensions 408 695 [on both sides if necessary] and check that the clearance will be equal for both left and right hand keys.

- b) Locking arm 408 699 tilts away not enough:
Adjust the excentric bolt 408 691 [fig.10].

2) Motor

Check the motor brushes and replace them, if they are worn out [use brushes EN 07092 for Dunker-motors and EN 07115 for Micro-motors, [red screws to open]. Replace motor if collector is worn out. Be sure to have right motor-pinion combination according to catalogue number]. Fasten the motor with its 4 screws M 4x8 to the main bearing plate 208 501 [fig.2], adjust it carefully and tighten the screws; the name-plate of the motor shall face downwards.

Connect the wires to the tag terminal L [fig.2] the red wire to the red terminal.

3) Drum driving shaft

Lubricate bearing 408 531 [fig.9] inside and outside with 3 drops of graphite-oil no. CAG 12; and collet 408 579 inside, and drive spring 409 225 outside, [if it is worn out inside, replace it] the drive hub (nave) 408 588 outside [if the polished part of it, as well as the polished part of the nave 408 534 of wheel 408 533 are worn out, replace them too.]

Push spring 409 225 into collet 408 579 until the protruding end engages the slot in the collet. Push the nave 408 588 [as in Fig.9] into this combination until the other end of the spring engages the slot of the nave.

Push the gear wheel 408 533 on to the bearing 408 531 and lubricate the polished part of its nave with 3 drops of graphite-oil no. CAG 12.

Push the combination spring-collet-hub on to the hub (nave) of gearwheel 408 533 and fix slightly the two screws 408 591

on hub (nave) 408 533, after having adjusted the axial play to max. 0,05 mm between hub (nave) 408 534 of the gearwheel and hub (nave) 408 538 [otherwise during operation one winding of spring 409 225 may drive itself into the slot or try to do so under the very high torque and wears out the hubs as well as itself.]

Push cams 408 533 and 408 542 [fig.9] on to the shaft and fix them slightly with their screws. Lubricate shaft 408 529 [fig.8] with 3 drops of graphite-oil no. CAG-12 and push the gearwheel groups 408 873 on it. Fix Benzing clip.

Lubricate shaft 408 550 [fig.8] with 5 drops of graphite-oil no. CAG 12 and push on it gearwheel 408 551 and reflex lever 408 552.

Fasten support 308 615 [fig.8] with the 2 flush screws 3x10 [upper holes].

Lubricate path of driver 408 616 as well as screw 408 624 with 2 drops of graphite-oil no. CAG 12.

Fasten magnet support 408 626 with 4 flush screws 3x28 [fig.4] [Be sure that the support has two holes for fixing the oil baffle, which was not used in early series machines. If necessary use new support].

Check that the hole for the magnet is absolutely clean [especially clean from metal dust!]

Push releasing lever 408 556 on to the shaft 408 550, it must depress ratchet 408 620 in its end position.

Check free movement of ratchet and spring.

Lubricate with one drop of graphite-oil no. CAG 12.

4) Backstrike damper

Lubricate bearing-bolt 408 630 [fig.8] with 2 drops of graphite-oil no. CAG 12 and push on control lever 408 631,

damper 408 751 and release lever 408 637. Secure same with Benzing clip.

Hook on spring 408 640.

Screw control rod 408 717 into driver 408 616 and 408 721 into reflex lever 408 552 [about 4 turns]

Push other ends over the respective bolts 408 634 of 408 631 and 408 637 [fig.4]. Secure with Benzing clips.

5) Locking arm 408 559

Check the armature 407 160 [fig.4]. The surface must be absolutely clean and smooth. If the smallest dent is visible on the surface, then the armature must be replaced.

Push the spherical-head screw 407 162 through the hole of locking lever 408 559, push the rubber washer 408 888 [which replaces the tripod spring 407 161] over it and screw the armature on [fig.4].

Tighten by aid of wrench 408 847. Be careful not to scrape the clean surface of the armature.

The armature must be free to move and to turn in the arm.

Push arm on to shaft 408 550.

6) Typewheel drive shaft

Lubricate bearing 408 573 [fig.7] inside and outside with 5 drops of graphite-oil no. CAG 12.

Push shaft 408 758 from right side into bearing and push gearwheel 408 575 on to it from left [fig.7] [Inspect polished hub (nave) 408 577 of it, if it is worn out, replace it]

Put 3 drops of graphite-oil no. CAG 12 on it.

Loosen the cylinder-head screw on the ratchet wheel 408 582 and 408 587.

Lubricate with 3 drops of graphite-oil no. CAG 12 each:
both collet 408 579 inside, both drive springs 409 225
[Inspect if worn out or damaged!] inside, collet 408 583 inside and nave 408 588 outside, check also these parts that they are o.k.

Assemble drive spring with right hand collet 408 579 [which still carries its ratchet wheel] [fig.7] and go on with collet 408 583, left hand collet 408 579 [with ratchet wheel], drive spring, and hub (nave) 408 588.

Ensure that the springs engage on both sides with their protruding ends in the slots of the collets.

Push the whole unit on to axle 408 758, respectively bearing 408 573.

Adjust axial play to max. 0,05 mm [see note at § C 3] and tighten slightly the screw 408 591 in nave 408 588.

Push locking arm 408 566 [fig.4] on to shaft 408 550.

Hook on spring 408 572 on locking arm 408 559 and threaded flat pin 408 571, and screw milled nut 408 569 to it.

Hook on spring 408 549 on reflex lever 408 552 and locking lever 408 559.

- 7) Clean front surface of magnet thoroughly, check that there are no scratches or other damage.

Push the magnet slowly into its place, and take care that no disturbance may occur to its front surface. Fix lightly with the one screw 3x10 after having turned it to the position as shown on picture. [In early machines which had 2 screws, use only the right hand screw!][fig.4]

8) Bearing plate

Push bearing plate 408 594 over shaft 408 758 and axle

408 550 [fig.6]

Fasten with 3 screws 3x8 [Take care not to break the thin wires of the wire cable at the soldering points of the collector!]

Put an extremely thin layer of petrol jelly, no. CAG 31 on the collector. Mount the scanning disk 408 602 [Take care of the brushes, and if they are bent away or worn out, replace them rather than to try to readjust them] and fix it lightly with the 2 screws 408 609.

9) Modifier

On machines which have a multipole-plug modifier 208 801, fix it [fig.2,3] with 3 screws, washers and distance tubes.

10) Miscellaneousness

Fix the oil baffle 408 874 with 2 screws 3x3 on the magnet support [Early series machines did not have baffles, but they are needed to prevent oil to penetrate to the magnet and the armature] [fig.2]

Fill the slot in the nave 408 872 (408 517) of gearwheel 408 571 (408 515) with grease no. CAG 33, push the wheel on to the shaft 408 514, secure with Benzing clip. [Fig.6]

D) Final Adjustment

1) Magnet

Loosen screw 1. 3x10 of Magnet EM 10 009 and move magnet forwards until it attracts the armature 407 160. After this retract both together until the clearance between the nose of locking arm 408 559 and ratchet wheel 408 587 is 0,7 mm. [fig.12]

Adjust all levers and arms on axle 408 550 to come flush with

their respective cams and ratchet wheels axially. Use distance adjusting washers [0,05x7 ϕ up to 0,2x7 ϕ] to do it.

2) Shaft 408 730 [Drum drive]

Loosen both screws 408 591 on hub (nave) 408 588 [fig.12]
Press with thumb and index this hub against the shaft [index on side of drum drive] Fasten with other hand one screw 408 591.

Check, that axial play is max. 0,05 mm

Fasten second screw.

Release armature and locking arm 408 559 manually.

Loosen flush screws on locking cam 408 537 and adjust angular clearance to 0,5 mm between this cam and driver 408 589 of hub (nave) 408 588 [fig.14].

Turn gearwheel 408 871 (408 515) clockwise by hand, withhold nose of locking cam 408 537.[fig.12] The whole shaft must not move, the small driving force shall be smooth and no "jumps" shall be felt.

Push locking arm 408 559 towards magnet so that the armature is attracted. [fig.12]

Turn the shaft 408 730 [through wheel 408 871 (408 515)] until nose of cam 408 537 stops at the rear part of locking arm 408 559.

Loosen both screws 408 591 of nave 408 588.

Turn the shaft until its driving nose [fig.1] points upwards vertically. [i.e. that the flat insert of this side of the shaft is absolutely horizontal; tolerance: 1° max. counter-clockwise, seen from right side of machine, as on Fig.1]

Turn hub (nave) [loose] 408 588 clockwise [fig.12] until clearance between its driver 408 589 and cam 403 537 is zero.

Fasten in this position both screws 408 591 [Use tool no. 308 496 to check]

3) Cam unit 408 538

Turn shaft 408 730 to starting position [fig.12] [Nose of cam 408 537 rests against locking arm 408 559, clutch is therefore free.]

Hold shaft with a clockwise torque to lower clearance of driver 408 589 nearest to zero.

Loosen both screws of cam unit 408 538 and turn clockwise until locking lever 408 566 is risen [against spring 408 572] and remaining path is 0,2 to 0,3 mm before snap-in. [fig.12] [Just before highest point of cam][Be sure that clearance of lever 408 552 against other part of cam is in that position about 0,3 mm]

Fix both screws of cam unit.

4) Cam 408 542

Turn cam unit [after having loosed its screws [fig.6] with shaft still in starting position] until contact EH 07056 closes, the cam shall be in about 1/3 of its way.

Fasten both screws.

5) Damper unit and control rods

Turn drum drive shaft to starting position.

Depress a key slowly. Observe movement of damper unit as well as rods 408 717 and 408 721 [fig.4, 10] The upper guide 308 679 must fall in and give a kick to the damper unit with its protruding bolt so that the unit turns clockwise.

The rod 408 717 pulls at the driver 408 616, and its ratchet 408 620 turns locking lever 408 556 out of contact with the ratchet wheel 408 582 [fig.13]

The damper 408 751 will make a little jump to avoid back-strikes.

Adjust clearance between pulled out locking lever 408 556 and ratchet wheel to 0,2 mm with rod 408 717 [remove clip on damper unit, pull out rod of bolt and turn it backward until clearance is reached, replace clip]

Depress a key and release magnet armature by pressing locking lever 408 559 against type wheel drive shaft.

Turn the gear system until inner cam of unit 408 538 deflects reflex lever 408 552 [fig.14] and rod 408 721 turns damper unit counterclockwise to release the locked key by tilting guide 308 679 into rest position. [Adjust roughly by turning rod out of lever 408 552]

6) Typewheel drive shaft

Turn gear system to starting position.

Depress a key.

Loosen screws on ratchet 408 582 and turn it so, that the place of the [ground off] nose lies approximately in the middle of collet 408 583 [fig.13]

Fix 2 screws of the ratchet wheel, with exception of the one which is farthest away from the [ground off] nose.

Place a spring retainer 408 768 and a washer under this screw and hook on spring 409 237 [instead of old spring 409 226].

Hook other end on bolt 408 585 of collet 408 583.

Give a light tension to this spring and tighten the screw which holds the spring holder [fig.13]

Check that axial clearance of shaft unit is max. 0,05 mm, otherwise readjust according to § D 2.

Loosen the 3 screws of ratchet wheel 408 587, adjust it that the right hand clearance against the driver 408 589 of the front collet 408 588 is about 0,5 mm [fig.12]

Tighten the screws, with exception of the one which is diametrically opposed to the driver.

Fix a spring retainer 408 768 and a washer under this screw and hook on a spring 409 237 (instead of old spring 40 226)

Hook other end on to spring holder 408 590 of collet 408 588.

Loosen the screws of holder 408 590 and retainer 408 768 so that the spring attracts them.

Fasten their screws.

Turn the shaft by hand until driving part 408 758 [fig.1] has the position shown [the protruding noses are horizontal, the larger one backwards. Difference is 1,0 mm, use tool no. 308 496 to adjust this exactly]

Turn typewheel drive shaft to zero position fig.1 and check position of scanning brushes, they shall stand in center of first dummy segment of collector, clockwise after the top contact segment fig.6

(With machines up to no. 6400 the brushes of disk 408 853 shall stand in center of the top contact segment; mount contact EN 07059 and adjust so that the operating spring lies in the deepest point of a valley of disk 408 853. Turn shaft clockwise by hand and adjust contact clearance, so that it always closes during 4° after the brushes have reached a new contact segment. The rest spring shall be moved about 0,01 mm by operated contact spring; adjust with crosshole adjusting screw.)

Adjust by loosening the two screws 408 591 of collet 408 588.

Connect the machine to outlet or battery.

Switch the machine on, press a key.

The typewheel driver shaft shall now revolve.

Try to stop the shaft with the thumb and fore-finger at the drive part, which engages the typewheel of the Cryptographer C-52, use no tool! If it is impossible to stop the shaft, the spring 409 237 is correctly adjusted; if the shaft can be stopped by hand, adjust both springs 409 237 at the two clutches. [Torque shall be - physically measured 3 - 4 cmkg, use tool no. 208 495 when checking this].

Check that, when running idle, the shaft can be stopped, with one finger on the ratchet wheel 408 582 and that the momentum felt is smooth and light.

Check this also with front clutch. [i.e. ratchet ring 408 587]

Switch machine off.

Disconnect cable.

7) Magnet

Push armature to magnet. Connect magnet to a DC source of about 12 V [The internal rectifier of the B-52 can be used, disconnect motor fuse, plug in battery cable and power and connect battery cable as shown on fig.15] through a variable resistor of about 2000 ohms and Milliamp-Meter [positive at red tag]. Raise current from about 10 mA up to 40 ± 10 mA when the armature shall release.

Adjust spring tension with milled nut 408 569.

Recheck with a dynamometer, force F to release lever 408 559 shall be about 550 g without current on magnet.

Solder the red/blue wire to the positive [red] tag and the other on the negative tag of Magnet EN 10 009.

Connect machine to power supply and switch it on.

Press a key and the machine shall make one complete sequence i.e.:

- a) the scanning disk shall turn until contact segment of depressed key is reached, then
- b) lock the typewheel driving shaft and release drum driving shaft...
- c) allow this shaft to make one revolution, at the same time releasing locking arm 408 559 of type wheel drive shaft ...
- d) release locking guide of keyboard unit.

If movements a to c are o.k., adjust rod 408 721 [fig.8,3]

If the key is not released, the machine will continue to run.

Loosen Benzing clip and remove rod from bolt of damping unit and drive the rod out of the unit of reflex lever 408 552, one or two turns.

Reengage rod at the damping unit and recheck function.

Turn rod out, turn by turn, until the machine works properly i.e. makes only one operation sequence if a key is kept depressed continuously.

Turn rod 1/2 turn more out and fix it definitely with Benzing clip.

8) Ratchet spring

(only with machines from 6501 up)

Turn the typewheel drive shaft in horizontal position [as in § D 6] Fix the ratchet spring at place of contact EN 07059 of early type machines [see catalogue L-027, page 11] using distance tubes, screws, washers and nuts.

Tighten screws so, that in horizontal position of shaft,

spring lies in valley of scanning disk and presses against it with about 190 grams.

Recheck operation of machine.

Disconnect machine.

9) Key contacts

Check clearance of the individual contacts in the row, they shall all be 0,8 mm.

10) Contact jack

In machines from no. 6501 up, on the right side, there is a small jack. Test this by inserting an insulated rod of 3,5 mm diameter as follows:

Connect machine and switch on.

Press a key.

The scanning disk shall now run idle.

Pull out the insulated rod, and the shaft shall stop at the correct place.

11) Final check

Write a bout 1000 times the letter which stops at the top segment.

The machines must always work correctly.

Write about 50 times the alphabet backwards.

The shaft shall properly stop at each segment and at no time jump over one.

Check function with an affixed Cryptographer C-52.

Change motor fuse, using EN 08524 [3A type]

Close hood and bottom plate, and recheck functions with

an affixed C-52.

Be sure that there are 2 fuses EN 08519 [0,3 A] for the mains circuit and 2 fuses EN 08524 [3 A] on the spare fuse holder.

Place machine in carrying case 208 806, put the cables in lid compartment and close.

E) Electrical lay out

Fig. 16 and 17 give illustrations according to the electrical diagrams S 404 023 and S 404 027 respectively. Item No. 5 [modifier] is only included in multialphabet machines; in those which have none, the connections of the keys go directly to the collector. S 404 023 holds for machines up to no. 6500, S 404 027 for machines from no. 6501 up to no. 6999.

Note that the machines work correctly with nominal voltage fluctuations up to $\pm 15\%$. At nominal voltage the rectifier shall furnish about 12,3 V with motor running. The motor speed is 4500 to 6500 R.P.M.

The magnet receives a current pulse of about 150 mA. This current can be checked if the cam contact (16) is abridged with a milliamperemeter, the collector brush stays on the contact segment of the depressed key, and the contact (17) is closed.

[Machines up to No. 6500]

In machines with transistor control [from no. 6501 upwards] this checking is no more possible, because the thermistor (14) prevents the current to reach high values on continuous duty. However, during normal run, the pulses in the magnet reach also the value of 150 to 200 mA.



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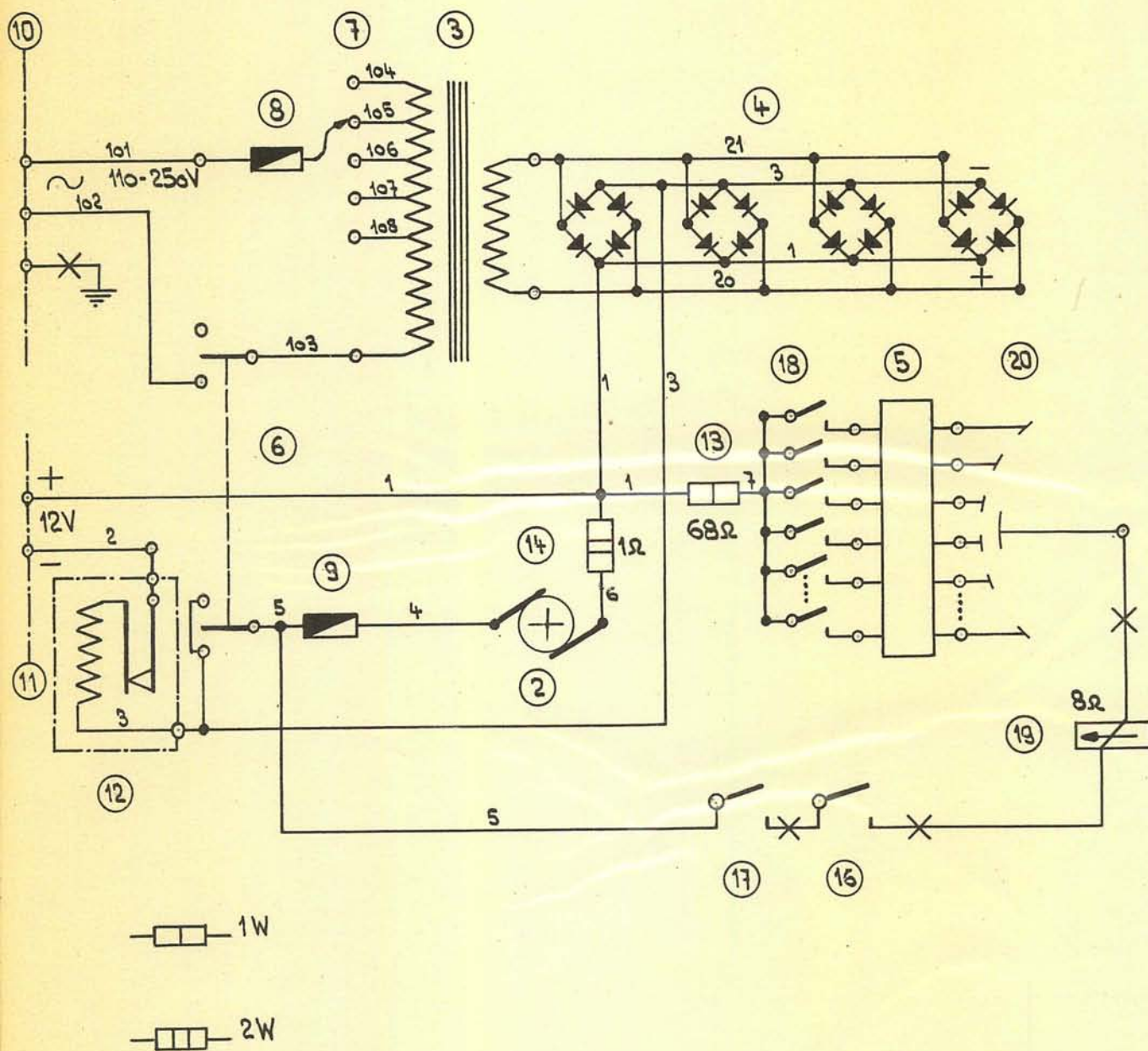
List of lubricants used in B-52

[only for service bench]

CAG 12	Graphite oil
CAG 21	Lubricating powder
CAG 31	Petroleum jelly
CAG 32	Grease
CAG 33	Grease

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Fig. 1 to 15
S 404 023
S 404 027



Änderungen:

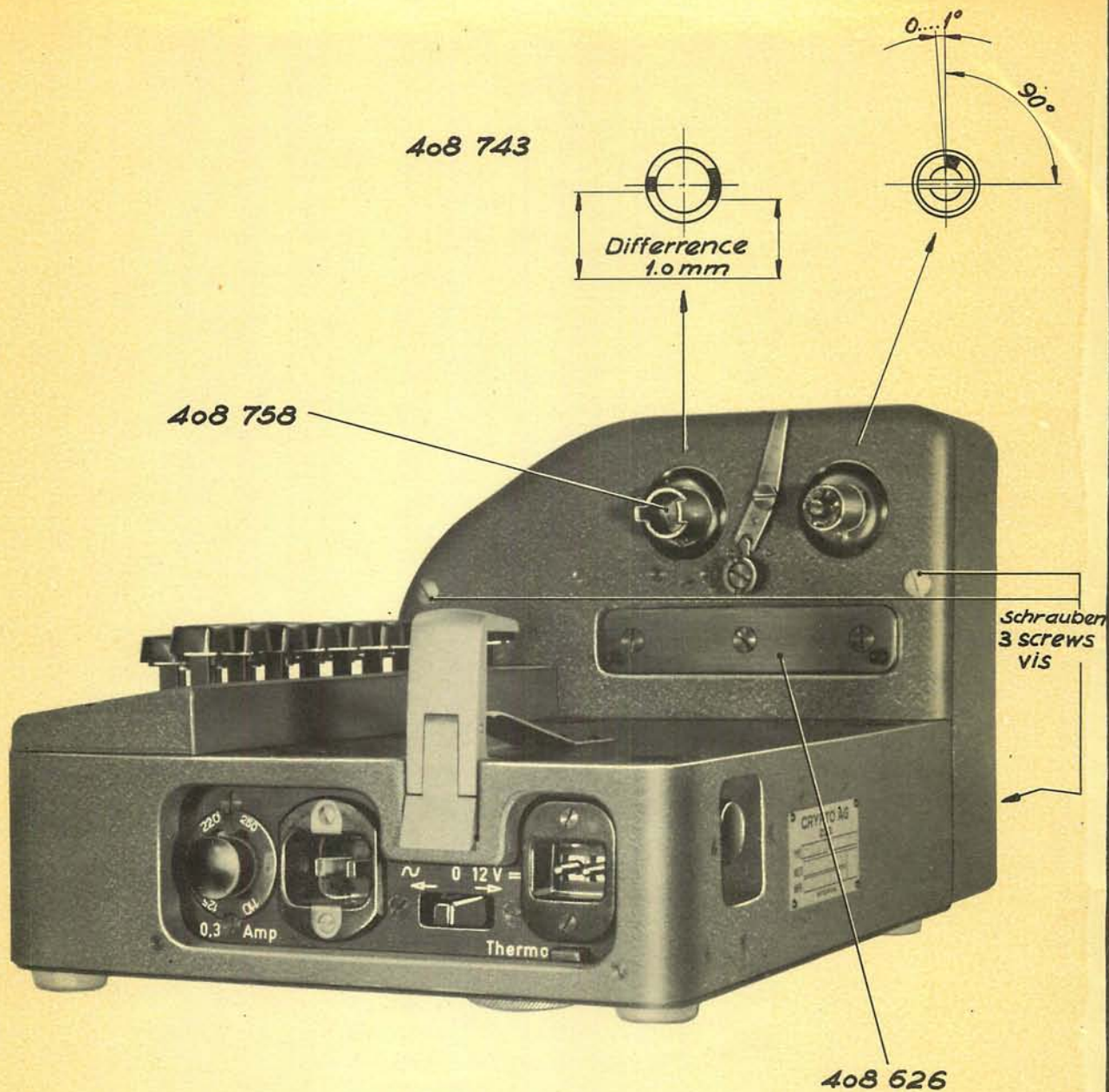
1 18.1.57, AM 130 2 28.2.57 AM 145

Ersetzt durch: S 404027

Ersatz für:

Klaviatur B-52	Masstab	Gezeichnet	12.11.56	B
		Geprüft		
		Gesehen		
CRYPTO AG. ZUG (Schweiz)		S 404 023		





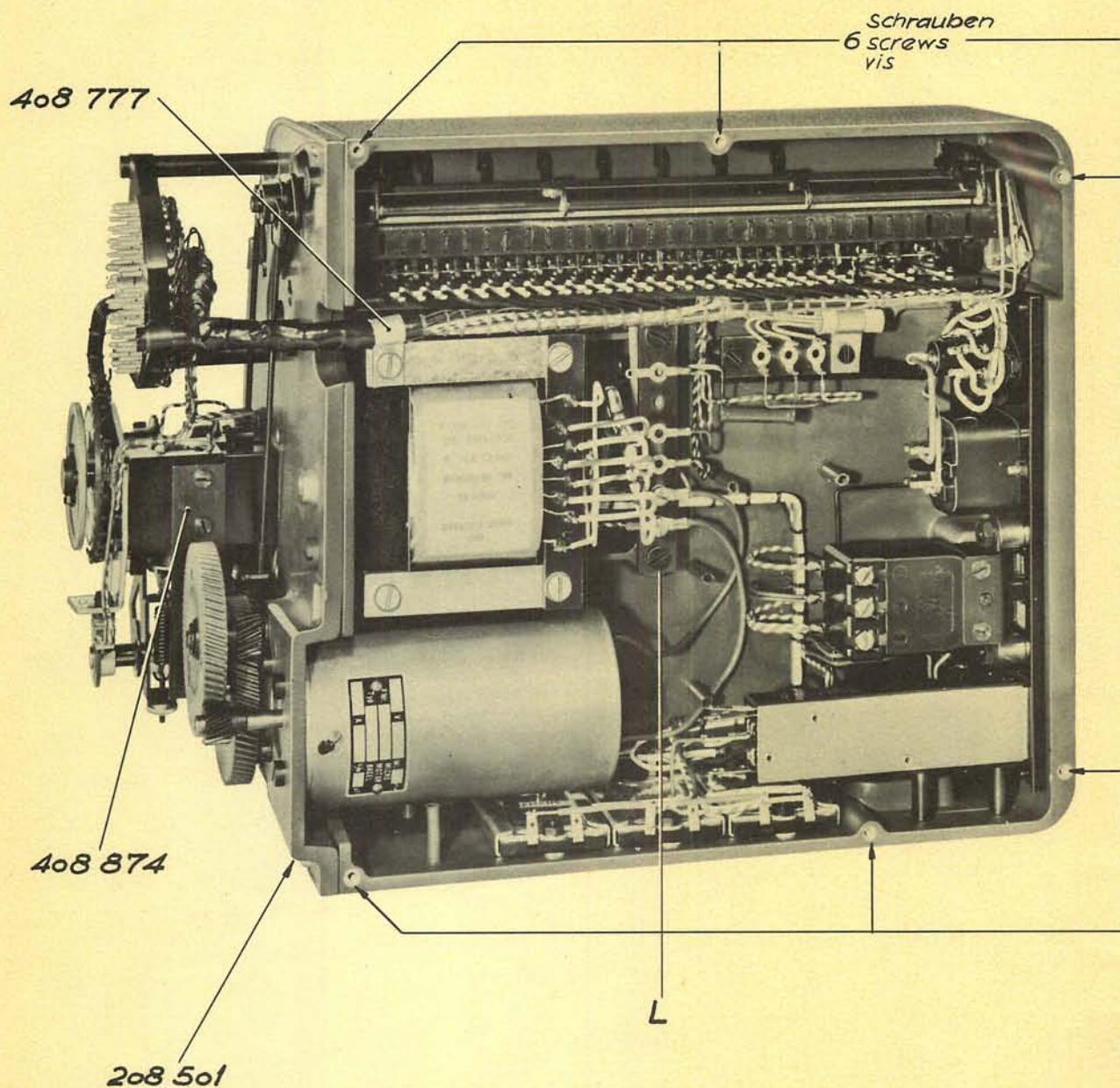
Wartungsanleitung
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Fig. 1

CRYPTO AG. ZUG (Schweiz)



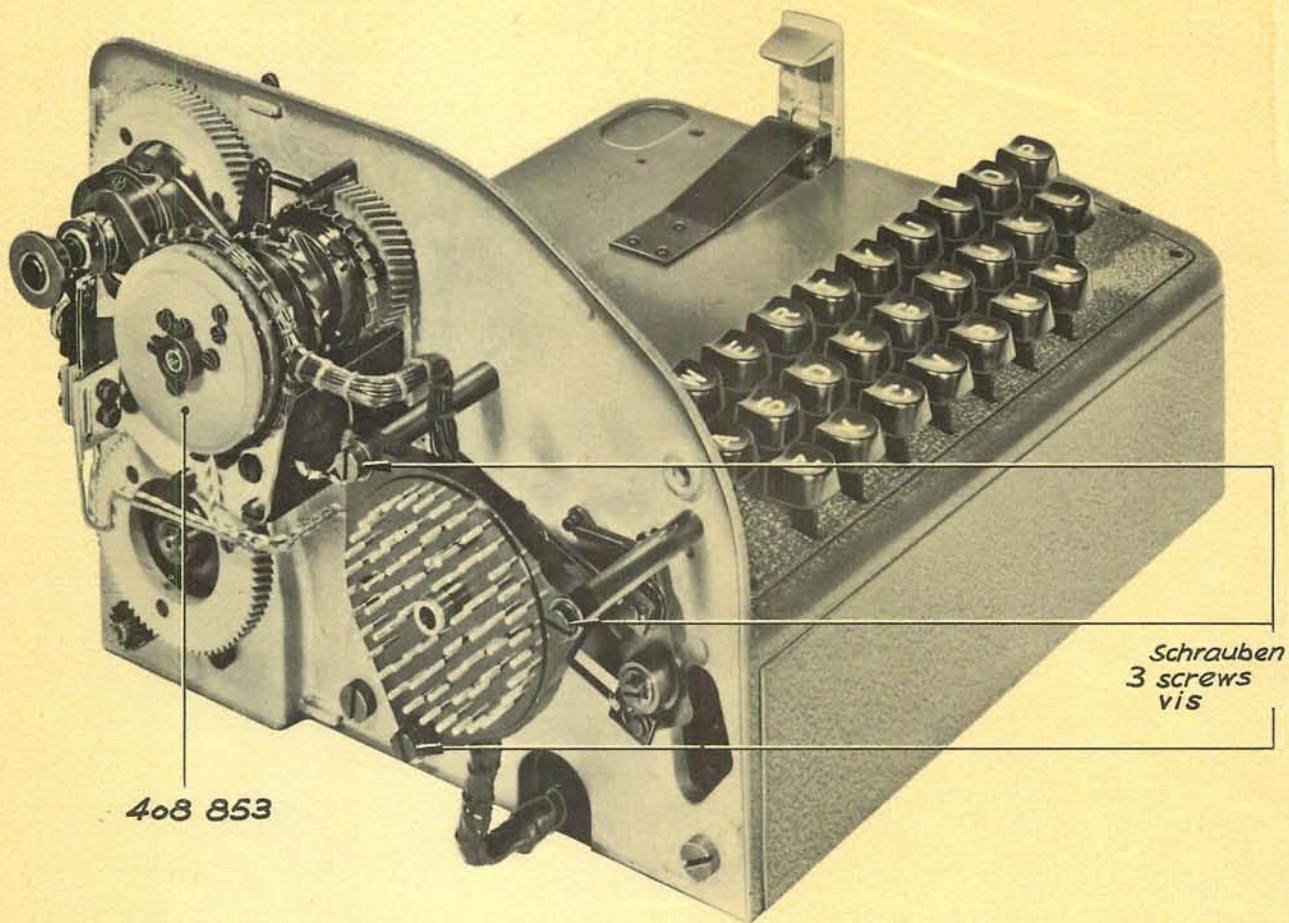
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Fig. 2

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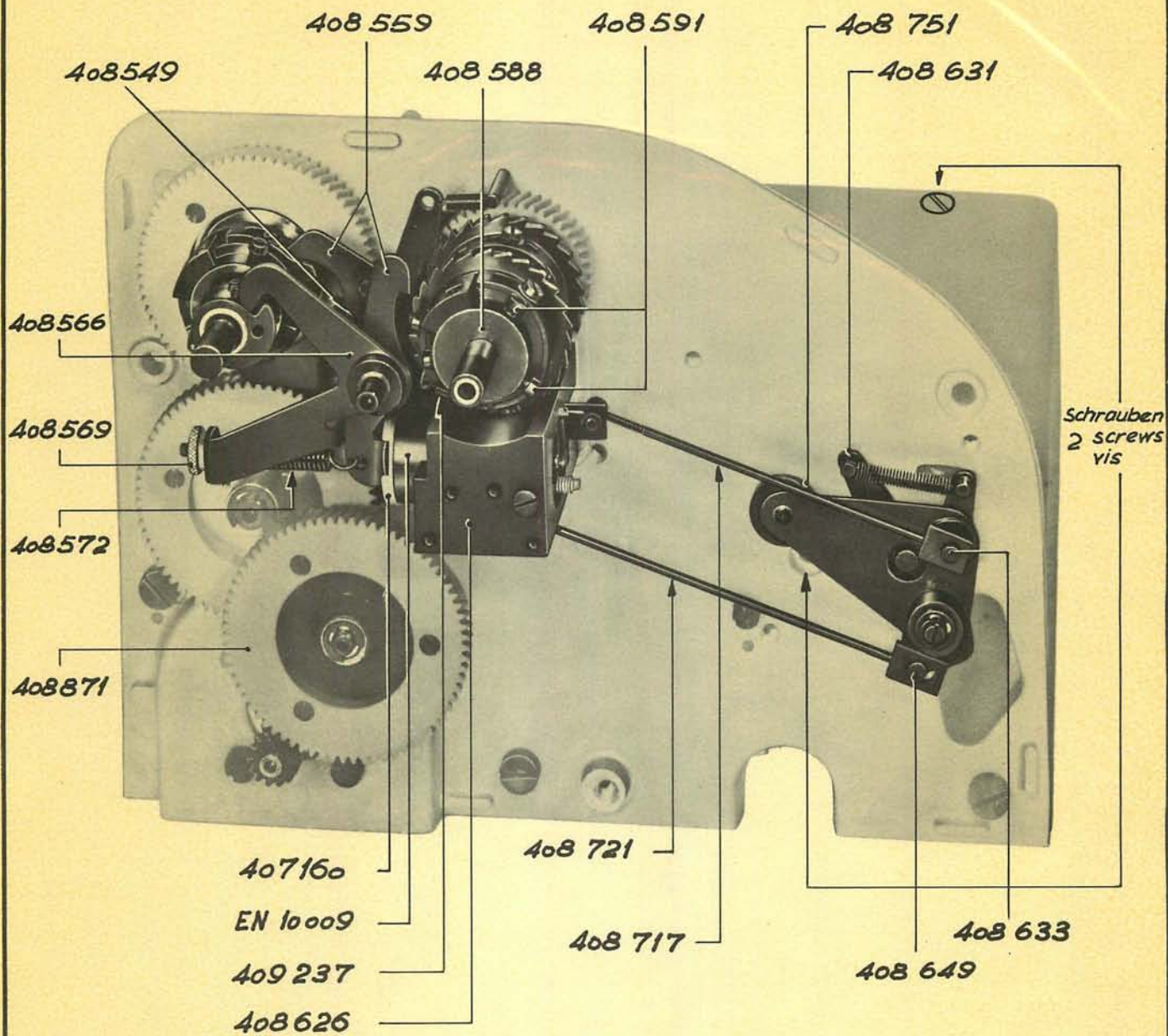
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Fig. 3

CRYPTO AG. ZUG (Schweiz)



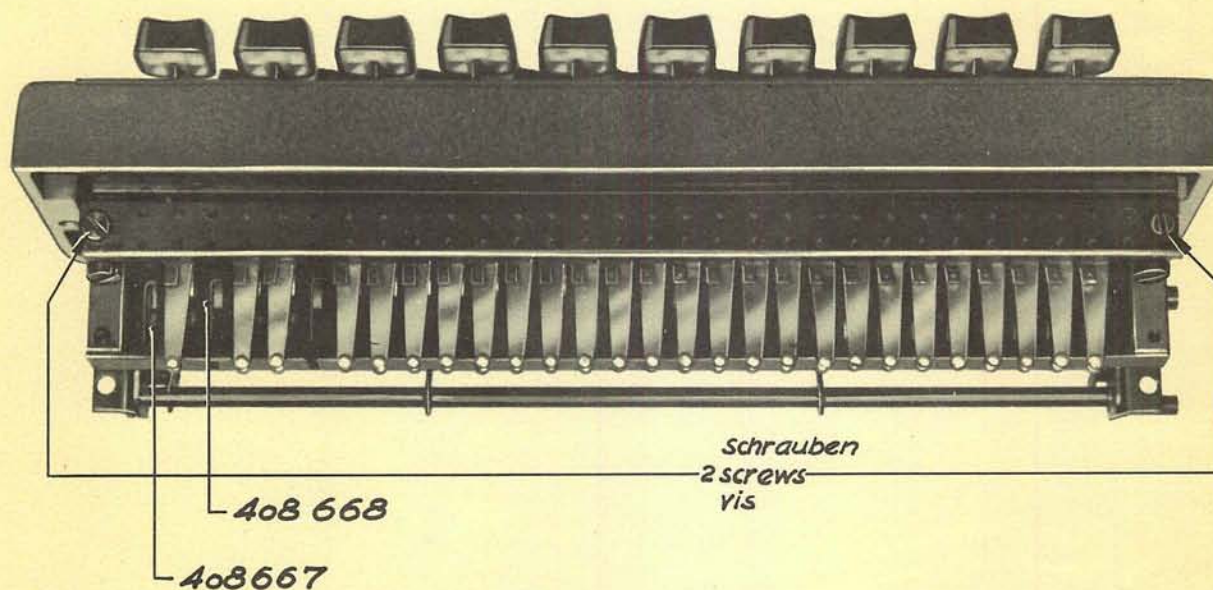
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Fig. 4

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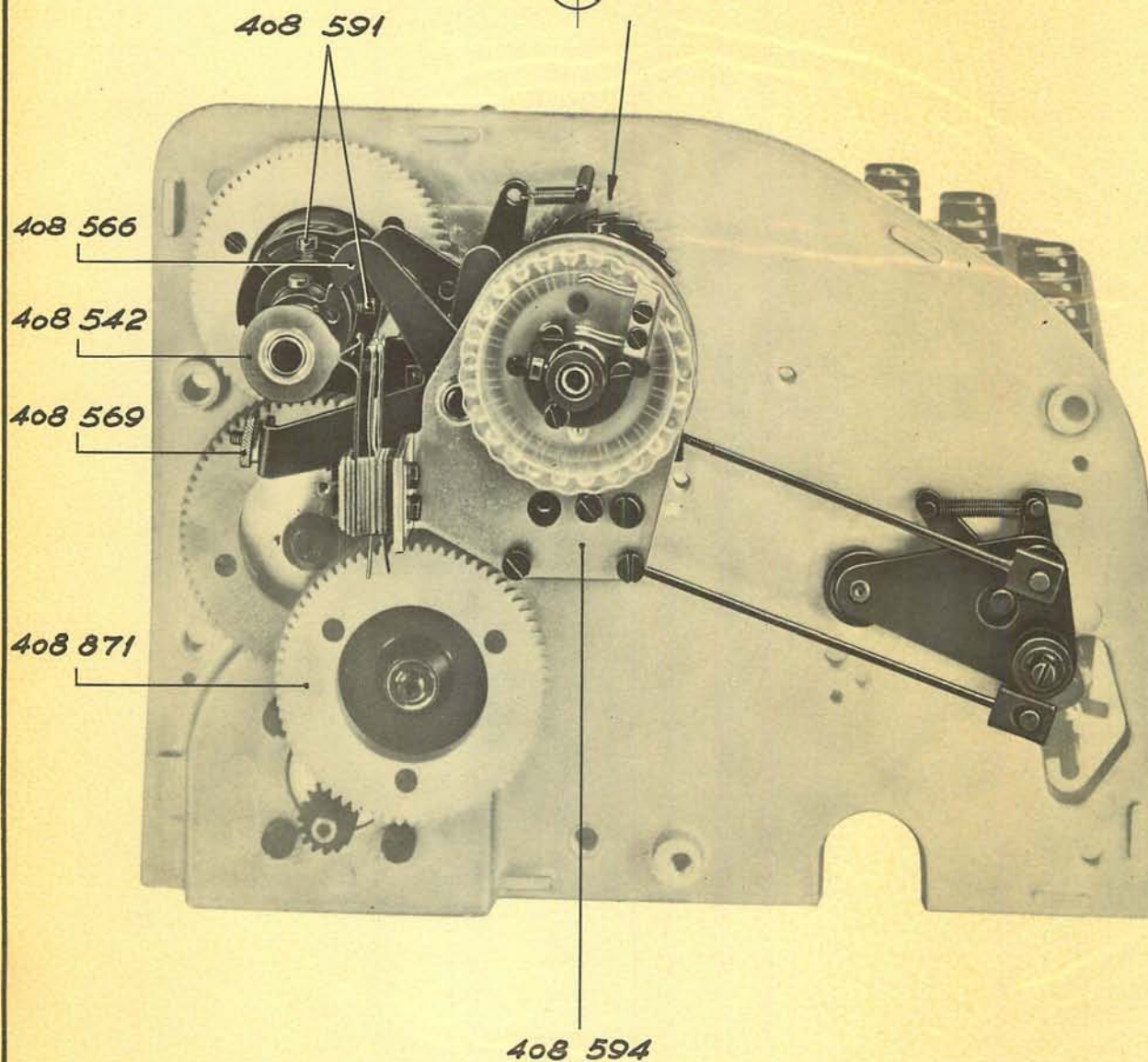
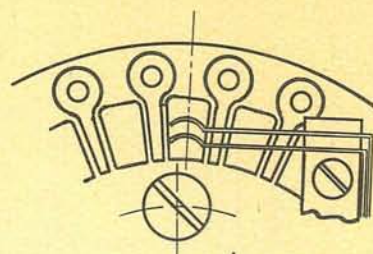


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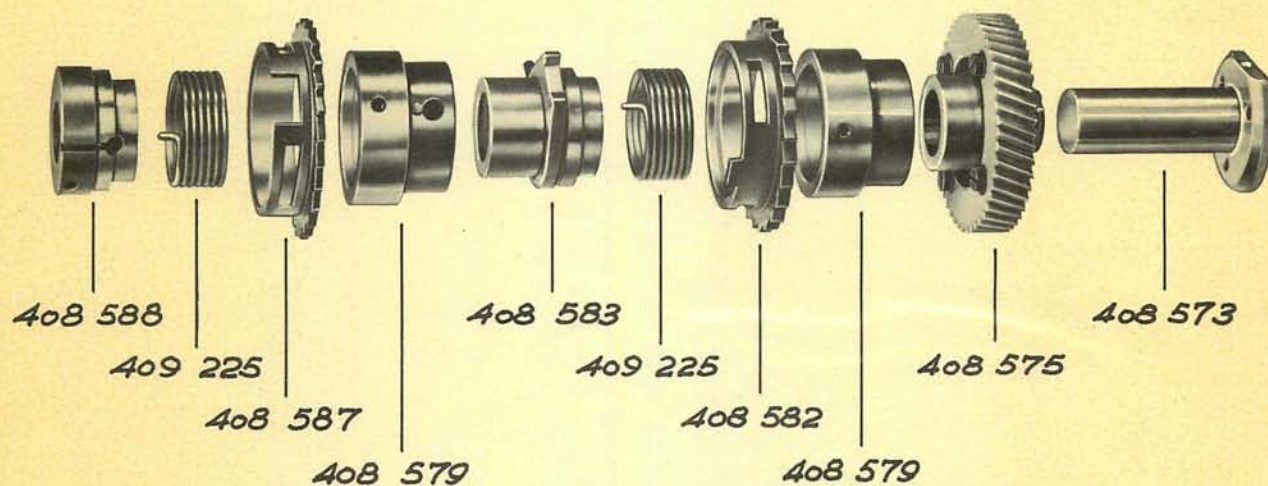
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Fig. 6

CRYPTO AG. ZUG (Schweiz)



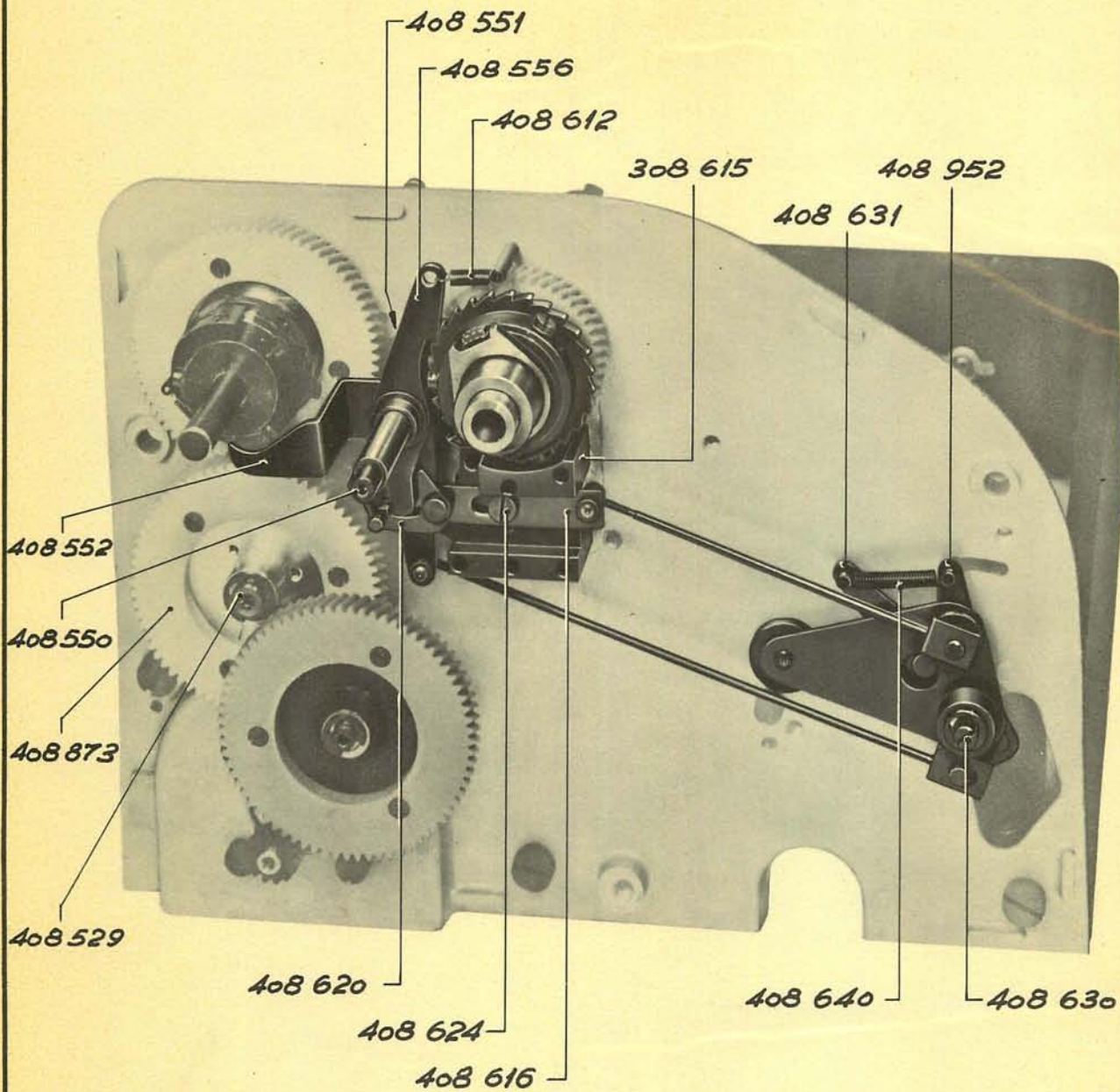
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Fig. 7

CRYPTO AG. ZUG (Schweiz)



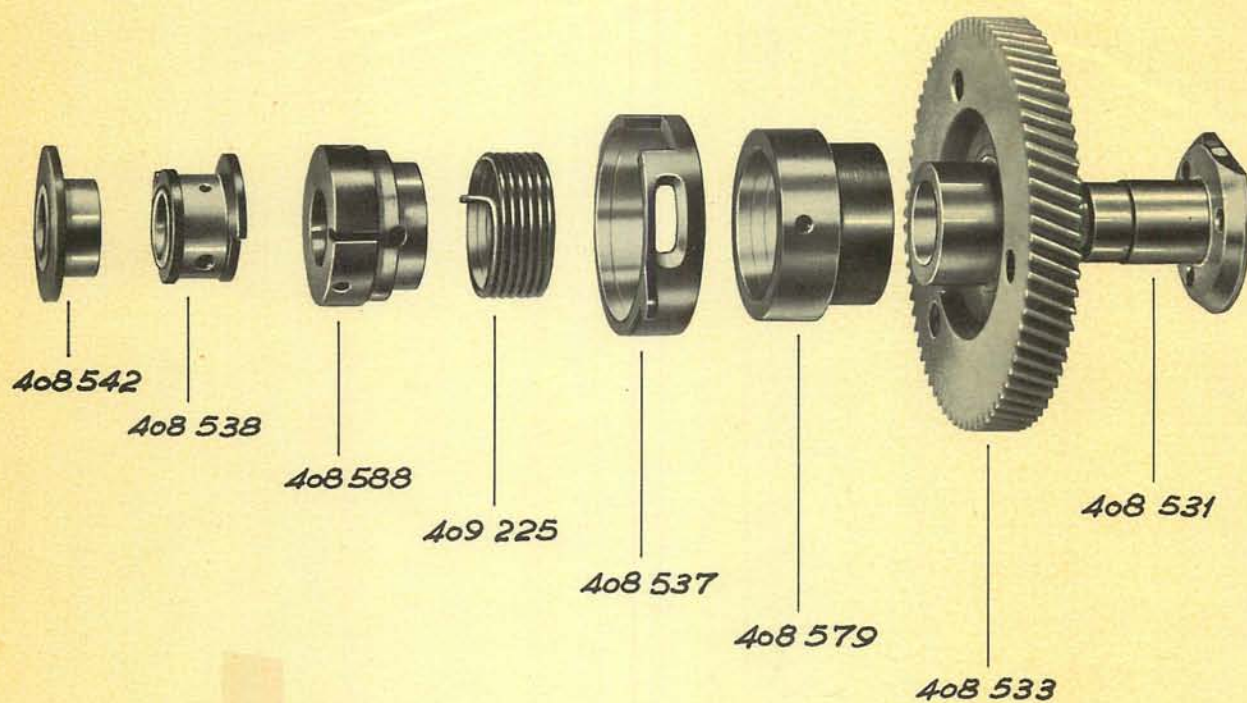
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Fig.8

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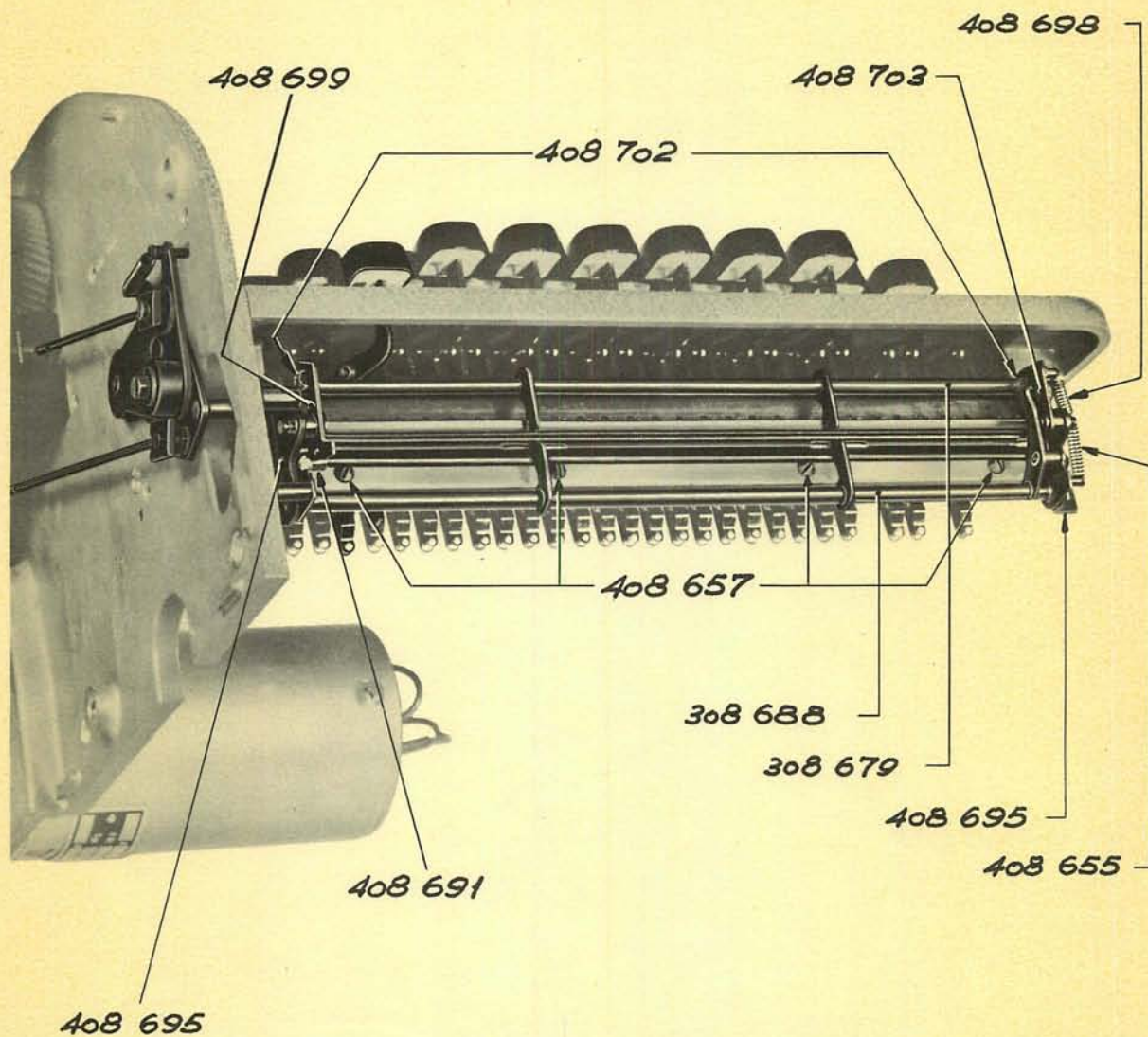
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Fig. 9



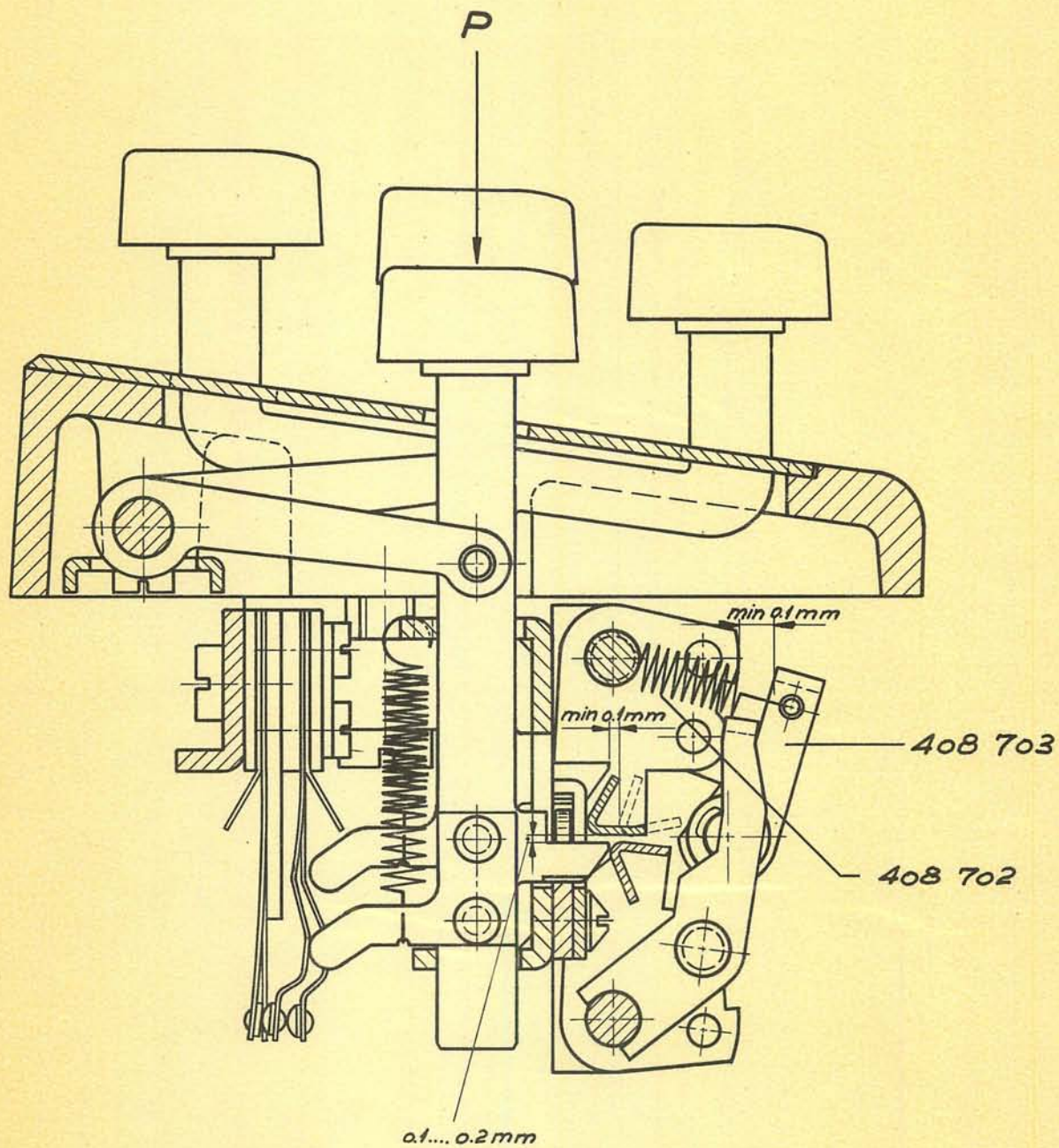
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Fig. 10

CRYPTO AG. ZUG (Schweiz)



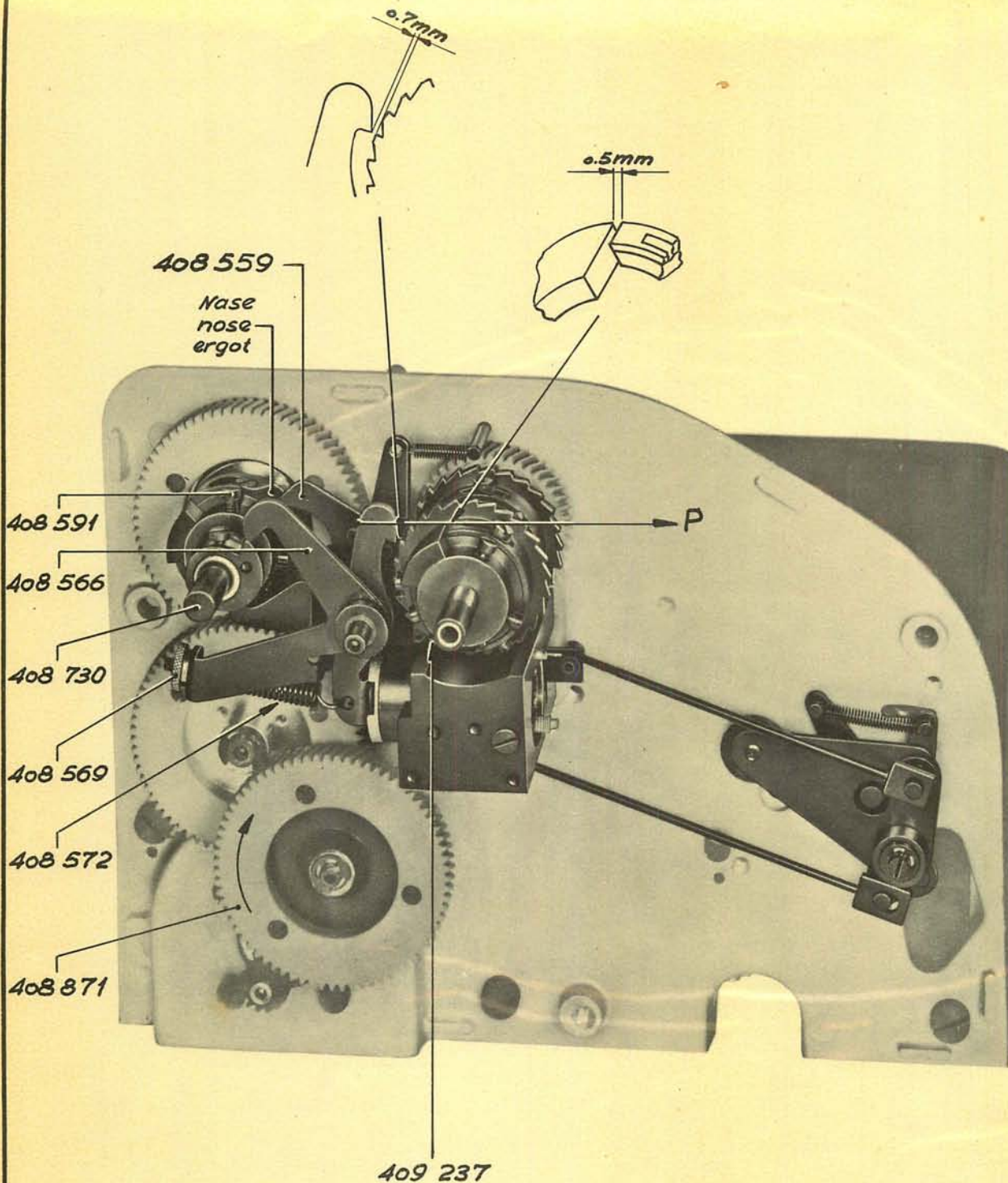
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Fig. 11

CRYPTO AG. ZUG (Schweiz)



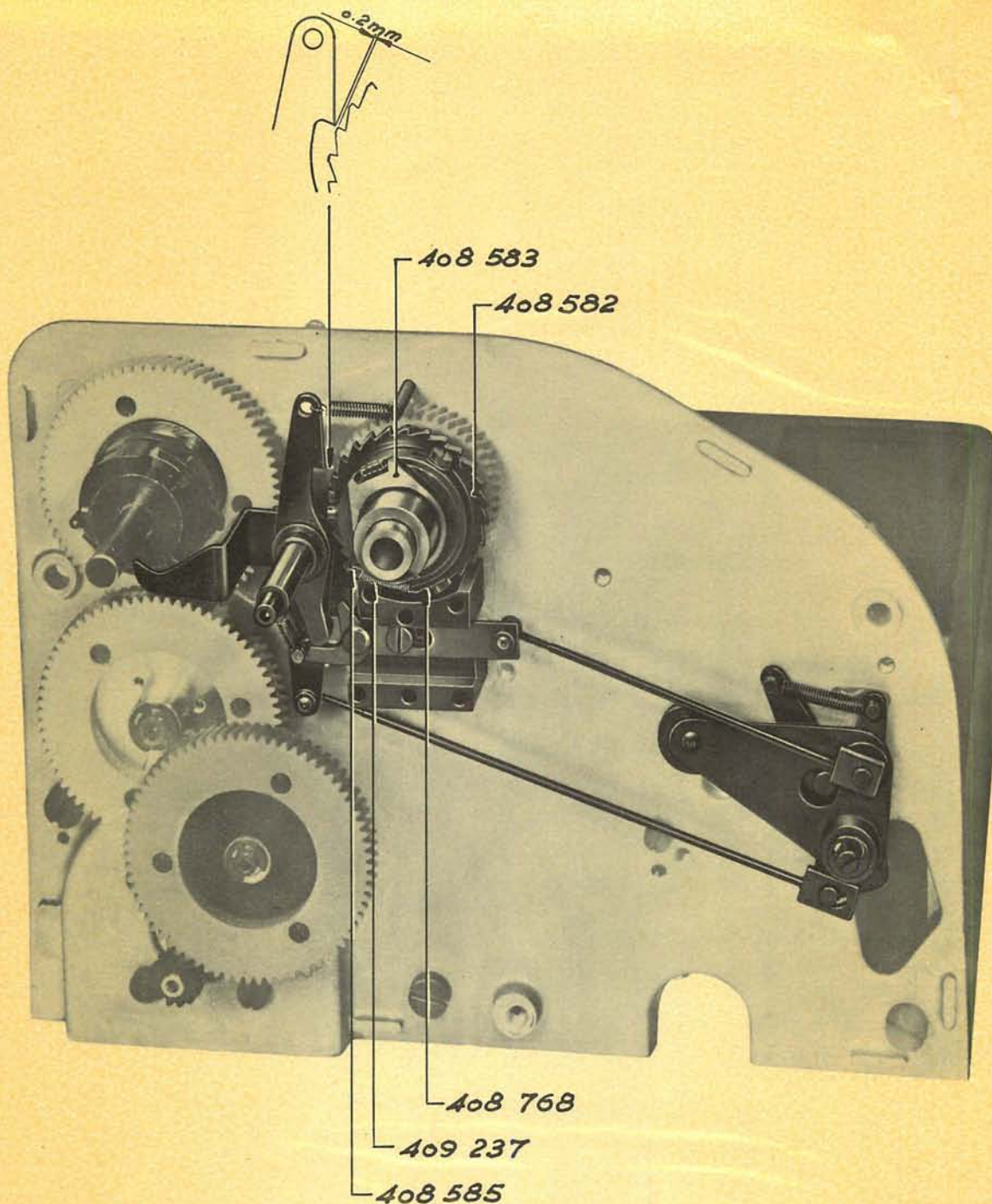
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Fig. 12

CRYPTO AG. ZUG (Schweiz)



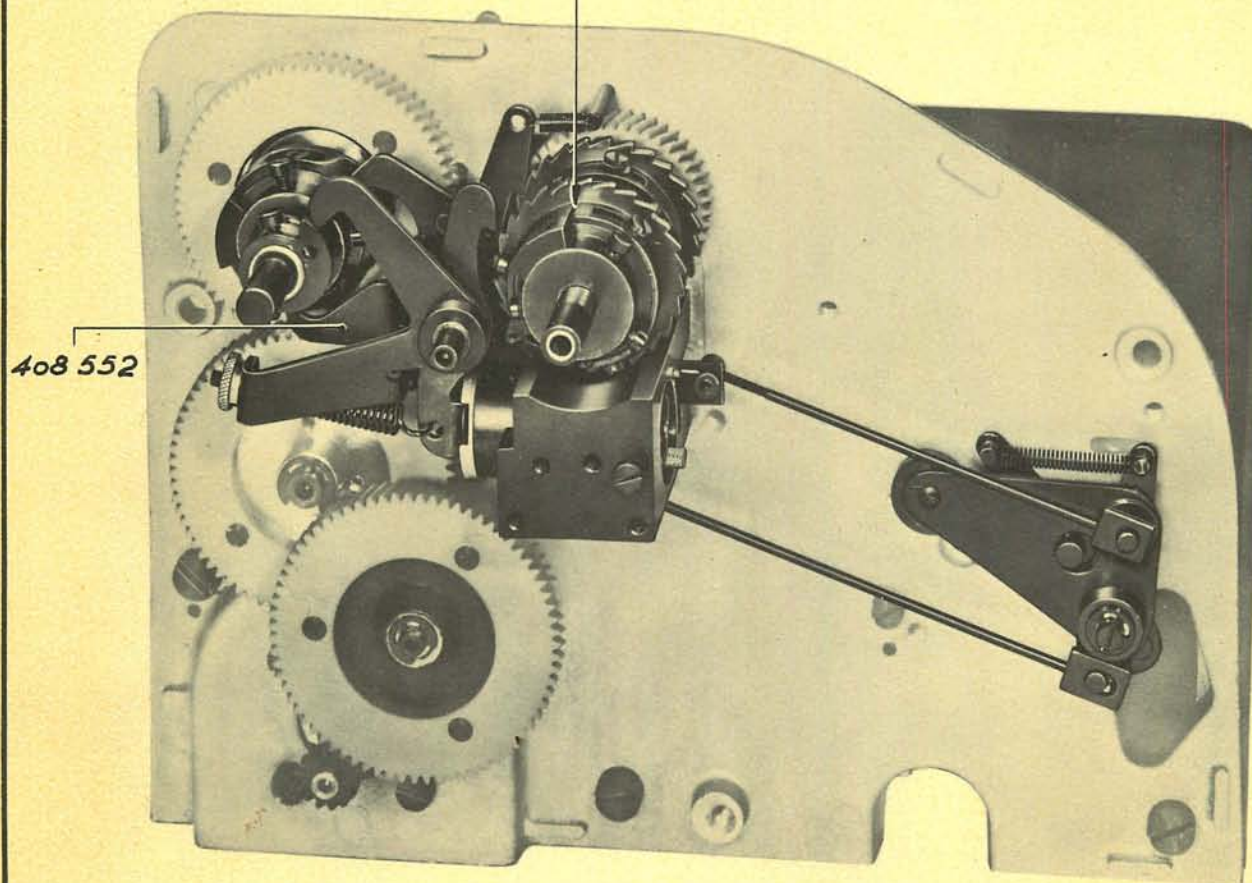
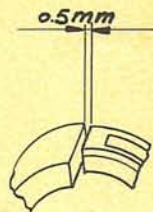
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Fig. 13

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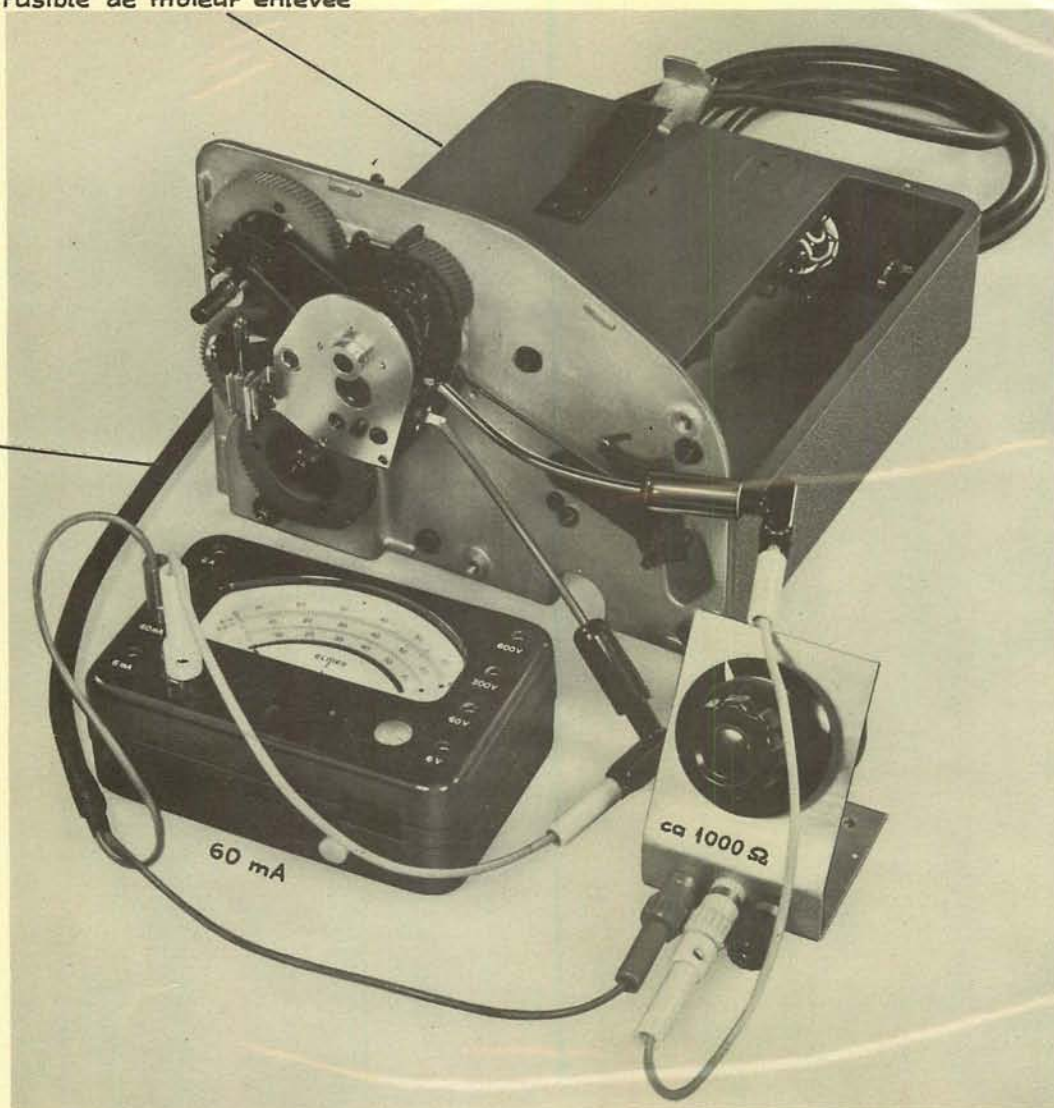
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Fig. 14

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Motorsicherung weg
 Motorfuse away
 Fusible de moteur enlevée

cable
 EN 90000



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Fig. 15

CRYPTO AG. ZUG (Schweiz)



Service instructions for
keyboard unit B-52

- 23 -

for machines No. 7000...7699

[Spare parts catalogue No. L-058]

Before attempting any operation read first the main part of instructions, page 4 to 21 to get accustomed with the machine as the following annexes explain only in short form the main alterations.

F) Dismounting the unit

Follow instructions of II-3121 page 3 ff. as close as possible.

G) Cleaning

Follow instructions of II-3121 page 7 and instructions given below.

H) Reassembling

1) Driving mechanism

a) Fasten screws of all bearings tightly.

Mount the following parts on their bearings, beginning at the left side, lower corner: Gearwheels 408 871, 408 873, 408 533, lever 408 552 with wheel 408 551, wheel 408 575.

Lubricate wheel 408 871 with CAG 32, all others with CAG-12. The whole group shall move very easy when turning wheel 408 871. Fix the Benzing clips No. 4 and 5 [Fig. 20]

b) Fasten driver 408 616 with screw 408 624 on to the support 308 615 and fix the whole with flush screw M 3x10 onto the base 208 501/1 [Fig. 8] be careful to alline the four remaining holes in the base and the support. Fasten now support 408 626 with flush screws

- M 3 x 28 and tighten all screws. [Fig. 4]
- c) Lubricate clutch spring 409 225 [which shall not be worn out otherwise replace!] inside and outside with CAG-12. Put it on the hub 308 588 which has already been fitted with its loose parts before. Push collet 408 580 onto this assembly [the collet having been fitted before with the stop nose 408 537/1]. Hook on the spring 409 237 and push the whole carefully onto the collet of wheel 408 533 [Fig.18].
 - d) Lubricate shaft 408 730 with CAG-12 and push it into bearing 408 531, fasten with one screw 408 591 onto clutch.
 - e) Assemble double clutch [Fig. 19] in analogy to § C above, [check springs 409 225!], lubricate well with CAG-12 and push onto gearwheel 408 575.
 - f) Lubricate shaft 408 758 with CAG-12 and push it into bearing 408 573, fasten with one screw 408 591 on to clutch.
 - g) Fit release lever 408 556 onto axle 408 550 which had been lubricated with CAG-12. Match it onto ratchet 408 620 and hook on spring 408 612 at the upper end [Fig. 8]. The lever shall match the clutch-ratchet-ring, if not, use adjusting washers 408 445 to 408 447.
 - h) Assemble damping unit [Fig. 21] consisting of part 408 952, 408 951, 408 640, 408 751 and clip No. 5. Lubricate with CAG-12 and push onto bolt 408 630. Secure with clip No. 4. Screw rod 408 717 into driver 408 616 and reflex rod 408 721 into lever 408 552 and hook other ends into damping unit [Fig. 21].
 - i) Fix armature 407 160/3 [which shall have an absolute flat surface on the magnet side, no scratches are allowed!] using rubber washer 408 888 and spherical nut 407 162/1, onto lever 408 559. When tight the armature shall just have clearance to move around, but shall not be loose, use adjusting washers 408 439...408 440 if needed.

Push lever 408 559 on to axle 408 550 [Fig. 22]

Hook on spring 408 549.

- j) Push reflex cam 408 930 onto shaft 408 730 and secure with one screw. Do the same with cam 408 929 and 408 542.

Fit lever 408 556 with spring 408 572, bolt 408 571, knurled nut 408 569.

Hook on spring 408 559 [Fig. 22]

- k) Clean hole of support 408 626, push magnet EN 10009 gently into it, be careful to avoid any damage to the magnet front piece [no scratch allowed!] Secure with cylinder head screw M 3 x 10 after magnet has attracted armature.
- l) Adjust plate 408 494 with centering collets and fix with cylinder head screws M 3 x 8. The axial play of the lever on axle 408 550 shall be 0.1 to 0.2mm. Adjust, if necessary with washers 408 445...447 [Fig. 23]
- m) Take the collector EN 07074, clean it carefully and grease it with just a very fine blow of CAG-31.
- Fix it with spacer 408 601 to the plate with flush screws M 2 x 8.
- n) Push cam disk 408 602, carrying the brush 408 881 onto shaft 408 752 and secure with the special screws 408 609, which shall engage into the wholes of the shaft.
- The brush arms shall have a bending of about 0,4 to 0,6 mm in detended position [Fig. 23].
- o) Mount the keyboard [see § H2] 408 449 with cylinder head screws M 4 x 14 and M 4 x 10 onto base [Fig. 24].
- p) Mount multipole plug [if any] with spacer tubes 408 813, spring washers 4,3/8, washers 408 812 and cylinder head screws M 4 x 52 [Fig. 24]

2) Keyboard

a) Screw into guide 308 665 one screw M 1,7 x 2. Fix the cage 408 668 and the guide 408 666 with a flush screw M 2,3 x 4. Fill in the 29 pulleys 408 667 [which has been lubricated in a small container with powder CAG-21] and fit the second screw M 1,7 x 2. [Fig. 25]

b) Fit the left and right support 408 663 and 408 664 into guide, the upper screw-holes shall show outward.

Fix the whole loosely with flush screws M 4x16 onto the keyboard 308 651 (308 654) [Fig. 25]

c) Fix loosely guide 408 659/1-3 with flush screws M 2,6x6 [Fig. 25]

d) Fit key levers 408 669/408 673/ 408 675, note that on the 26 div. keyboard the places 1, 25, 28, 30 from left are left free.

Tighten all screws and hook on the springs 408 678 [Fig 27]

e) Check that all key levers move easily, and that only one at a time can be depressed.

f) Fix left plate 408 461 with cylinder-head screws M 3x8 onto guide. Fit bar 308 450 up and 308 456 down onto the plate and fix right plate 408 463 [Fig. 26]

There shall be an axial clearance of 0,2...0.4 mm for the bars 308 450 and 308 456.

There shall be an overpass of 0,1 mm against the lower bar with each depressed key [Fig. 27].

g) Hook on both spring 408 472 and 408 471. Fit locking lever 408 468 and secure with clip 3.2. Hook on spring 408 473 [Fig. 26].

h) Put on cover plate 408 652/1-3. Fix with flush screws M 2,6 x 4. Put on the key buttons which may be fixed

with plastic glue.

- i) Lubricate the steel spring of the contact row EN 07058 with just a film of CAG-31 and fix row with cylinder head screws M 3 x 6 onto frame [Fig. 5].

Check that each contact spring has a clearance of 0,8... 1,2 mm against its key-nose. A key being depressed shall move the other contact spring at least 0,2mm [Fig. 27].

Lubricate according to Fig. 27.

- j) Checking:

Depress each key once. Hold key down and release upper locking bar by hand. Release key slowly, the lower bar must definitely fall in and the key-lever-nose shall not knock the upper bar while moving past by.

I) Adjustment

1) Magnet (roughly)

Loosen cylinder head screw at support 408 626 and displace magnet [together with attracted armature] until there is a clearance of 0,4 to 0,9 mm between locking lever 408 559 and highest point of a tooth of the ratchet ring. The armature shall at this point be under no bending force and lie flat against the magnet. [Fig. 22]

Tighten cylinder head screw of magnet [be sure to turn magnet at position shown in Fig. 12 i.e. the soldering tags showing toward the main base plate].

2) Drum driving shaft

- a) Fix shaft 408 730 with gauge 308 496 which remains at its place for all operations up to d). Loosen screw 408 591 of the driving collet 408 588. Loosen the three screws of the locking cam 408 537/1. Turn this latter until the screws stands about on center of the oblong openings and tighten the screw. Affix spring hook

408 768 also about in center position.

- b) Loosen screw of driver 408 589 and move it until there is a clearance of 0,5 to 0,7 mm between it and the locking cam 408 537/1 which shall however not touch the lever 408 559. Tighten the screw [Fig. 28]
- c) Turn driver 408 589 clockwise against locking cam and push this latter against the locking lever. Tighten now both fixing screws 408 591. Be sure to have a maximum axial clearance of 0,05mm!
- d) Turn reflex cam 408 930 so then will be a clearance of 0.2 to 0.4 mm against the reflex lever 408 552. Put lever 408 566 in groove of cam 408 929 and tighten screws [Fig. 29]

Adjust cam disc 408 542 so that contact EN 07056 is closed and the spring is just in the first third of that cam [Fig. 23]

All these adjustments are made with the driver pushed against the locking lever.

Put the gauge 208 496 away.

3) Typewheel driving clutch

Loosen the screws of both ratchet ring 408 582 and 408 587, turn the rings so that the screws will stay in the center of the oblong holes and thigten.

Move spring hook 408 768 to about half of the way. Adjust driver 408 589 to have a clearance of 0,5 to 0,7 mm [Fig. 20]

4) Control rods

- a) Disengage rod 408 721 at damping unit.
- b) Adjust rod 408 717 by turning it, so that at a depressed key the locking lever gives way to the clutch and that a clearance exists between lever and the top of ratchet

tooth of 0,15 to 0,3 mm [Fig. 21]

c) Reengage reflex rod 408 721

Push one key and release magnet armature by hand. Turn gearwheel 408 871 slowly clockwise, while the key is held down by hand. Observe through hole near damping unit the locking lever 408 468 which will lock into bar 408 450. At this moment the reflex-lever 408 552 shall be just before its highest position on the reflex cam. Adjust by turning the reflex rod 408 721. Secure both rods with Benzing clips [Fig. 28]

5) Magnet (final)

- a) Feed magnet out of a 12V DC supply through a milliammeter and a 1000 Ω rheostat [see fig. 15, note that in machines having a new fuse plate EN 08546, the thermal switch is in the motor circuit, so a wire of this shall be unsoldered to stop the motor]

Rise current until armature is released, cut off current, turn resistor to highest value and turn gearwheels until armature has been replaced and is ready to fall of again.

Switch current on again and rise current.

Adjust tensions of spring with knurled nut 408 569 so that the current to release the armature in 55...65 mA for Magnet EN 10009.

- b) Check the release force with a dynamometer at point P [Fig.12] it shall be at least 600 gr with no current at the magnet. Solder the red/blue wire to the positive tag and the other to the negative tag of Magnet EN 10009.

6) Typewheel drive shaft

- a) Feed machine with current

b) Push the key of the uppermost letter on the collector
[Normally A] [Fig. 23]

c) At the end of movement of shaft 408 758 check the
difference of the noses at the driving side [Fig. 30]

It shall be 1 mm [can be checked with tool 308 496]

Adjust exactly by turning the collet 408 588 of the
clutch against the shaft 408 758. Tighten both screws
of collet.

The axial clearance shall be at maximum 0,05 mm.

At this position the brush of the selector disc shall
stand amidst a blank segment of the collector.

d) After several triggerings according to b) and c) fix
spring 408 936, plate 408 727, spacers 408 937 with
cylinder head screws M 2,3 x 16, spring washers 2,3/4,5
and hex nuts M 2,3 [Fig. 23]

The ratchet spring shall be adjusted now to fix the type-
wheel shaft in its above mentioned position with a maxi-
mum deviation of 0,1 mm clockwise. Be sure that the spring
does not bend the shaft in anticlockwise direction because
this would give a continuous torque to the clutch which
could be worn out very quickly.

The spring shall press with 200...350 gr into a groove of
the cam disk.

7) a) Write several letters to check that the spring 408 936
catches the shaft always into correct position.

Fix the oil baffle 408 889 with two cylinder head screws
M 3 x 3 onto support 408 626 [Fig. 35]

b) Fix cover with 2 screws 408 793 and one cylinder head screw
M 5 x 25 using a rubber washer 408 765 and a washer 513/12
each. Do not tighten too much to prevent bending of the
mounting base.

c) Fix bottom cover with flush screws M 3 x 5 [Fig. 35]

- 8) Adjust emergency release knob 408 894 by moving the whole cover toward the left or the right; if this is not enough, loosen the flush screws M 2x6 of the knob group and move this. The adjustment must secure that the magnet is release only once. [Can be checked by taking off the blank plug 408 910 at the right side jack of the keyboard and inserting instead a insulated rod of 3,5 mm ϕ , if a key is depressed now, the magnet will have no current, so it can be released with the emergency knob.]

[See Fig. 34]

J) Final Check

See main instruction for this [page 20 ff]



Service instructions
for keyboard unit B-52

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for machines from No. 7700 up
[spare parts catalogue No. L-058]

Before attempting any operation read first the main part of instructions page 4 to 21 to get accustomed with the machine as the following annexe explains only in short form the main alterations.

The following instructions are based on these for machines No. 7000 to 7699 [which shall also be studied carefully] and refer only to the alterations in the machines from No. 7700 up.

K) Changed and additional parts

<u>No. 7000 to 7699</u>			<u>No. 7700 up</u>
Shaft	408 730	changes to	409 292
Lever	408 559	changes to	409 275
Lever	408 566	changes to	409 284
Cam	408 929	changes to	409 288

Additional parts

Locking lever 409 280
Spring 409 291
Spring holder 409 290
Cyl.head screw M 3 x 10

L) Reassembling of the driving mechanism

see § K before, change as follows:

j') Push reflex cam 408 930 on to shaft 409 292 and secure lightly with screw. Put cam 409 288 and cam 408 572 to place as well as lever 409 284 with spring 408 572 threaded bolt 408 571 and nut 408 569. Hook spring onto lever 409 275 [Fig. 32] affix locking lever 409 280.



k') Adjust plate 408 594 with cenetring collets and fix it with two cylinder head screws M 3 x 6. Clamp spring holder 409 290 under the left screw M 3 x 10 [Fig. 31] Axial clearance of the levers shall be 0,1 to 0,2 mm. Adjust with spacing washers 408 445 to 447.

M) Adjustment

See § I before, change as follows:

2d') Adjust reflex cam 408 930 to let a clearance of 0.2 to 0.4 mm between its nose and the reflex lever 408 552.

Adjust lever 409 280 to be tight on the radial face of the cam 409 288 [Fig. 33] tighten the screws.

Adjust cam 408 542 as per 2d)

All adjustments are done with the driver 408 589 put tightly to the counterpart.

Take away adjustement gauge.

OSt/gs

April 1961

Encl.:

Fig. 16...37

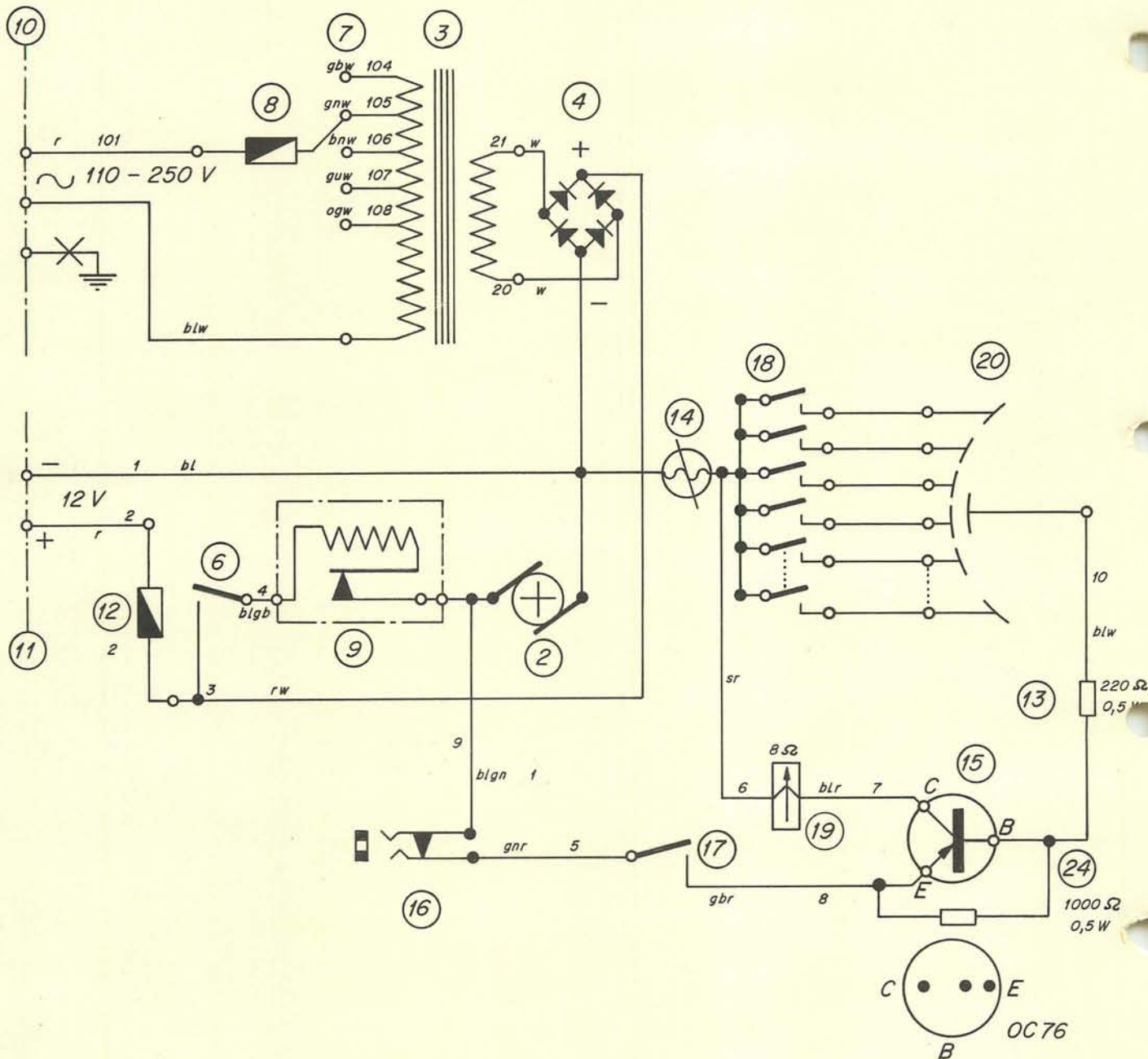
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S 404 055

S 404 214

S 404 215

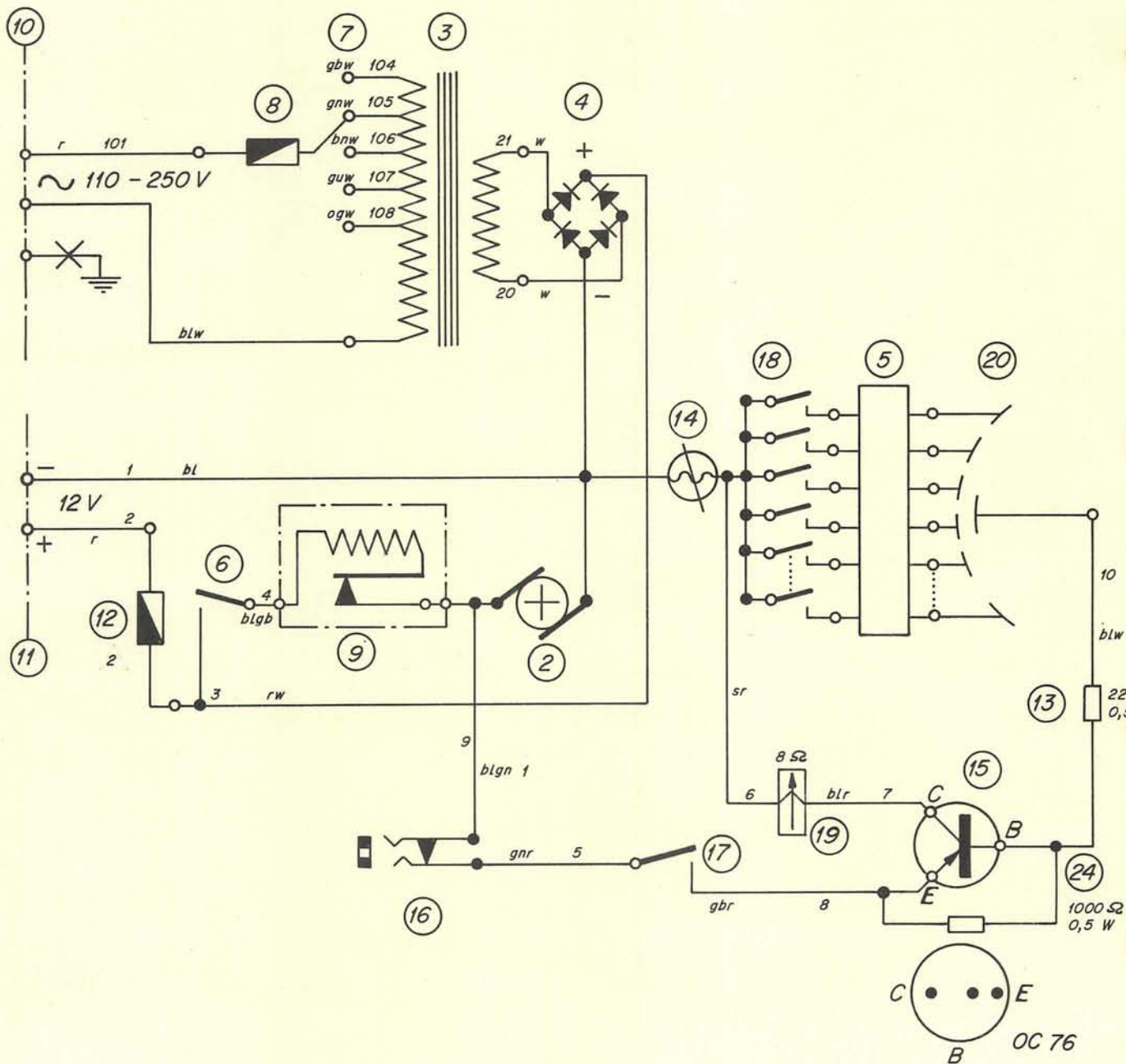
Verwendet für:



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		2	AM 753	9. 9. 60	
Thermische Behandlung:					
	Ersetzt durch:	Ersatz für:	Vergrößerung gez.:	Anzahl sep. Stücklisten	
Allg. Oberflächengüte:	Klaviatur B-52				Masstab:
Allg. Toleranzen:					Gezeichnet
Längenmasse:					Geprüft
Winkelmasse:					Gesehen
Bohrungen:					
Wellen:					
Rundlauf:					
Planlauf:					
CRYPTO AG. ZUG (Schweiz)				S 404 055	

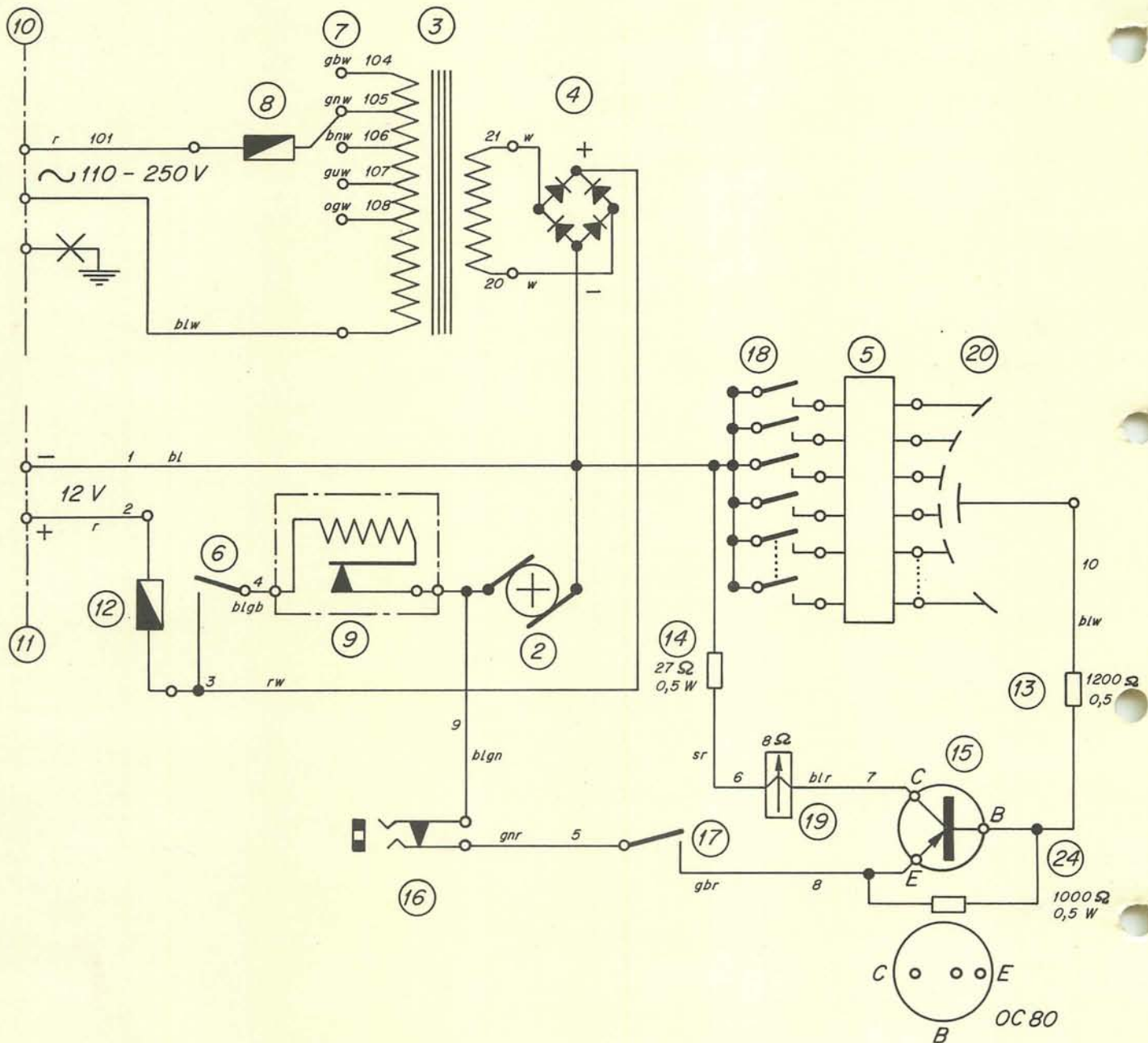
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			△		△		△		
			△		△		△		
Thermische Behandlung:									
Ersetzt durch:			Ersatz für:		Vergrößerung gez.:		Anzahl sep. Stücklisten		
Allg. Oberflächengüte:	<i>Klaviatur B-52</i>					Masstab:	Gezeichnet	27. 6. 61	W. Sch
Allg. Toleranzen:							Geprüft		
							Gesehen		
Längenmasse:	CRYPTO AG. ZUG (Schweiz)					<i>S 404 215</i>			
Winkelmasse:									
Bohrungen:									
Wellen:									
Rundlauf:									
Planlauf:									

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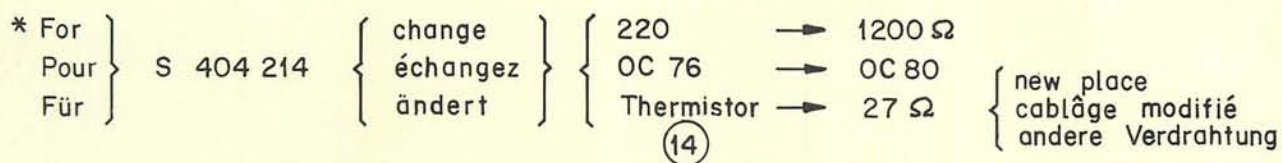


Oberflächenbehandlung:	Pos.	Stück	Gegenstand	Zeichnung	Bemerkung
	Material:		1 AM 435 4. 6. 59		
			2 AM 753 9. 9. 60		
Thermische Behandlung:					
	Ersetzt durch:	Ersatz für:	Vergrößerung gez.:	Anzahl sep. Stücklisten	
Allg. Oberflächengüte:	Klaviatur B-52			Masstab:	Gezeichnet 24. 10. 58 Bau
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Längenmasse:					Gesehen
Winkelmasse:	CRYPTO AG.			S 404 054	
Bohrungen:					
Wellen:	ZUG (Schweiz)				
Rundlauf:					
Planlauf:					

Verwendet für:



Oberflächenbehandlung:	Pos.	Stück	Gegenstand	Zeichnung	Bemerkung
	Material:				
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Längenmasse:					Gesehen
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Bohrungen:					
Wellen:	ZUG (Schweiz)				
Rundlauf:					
Planlauf:					

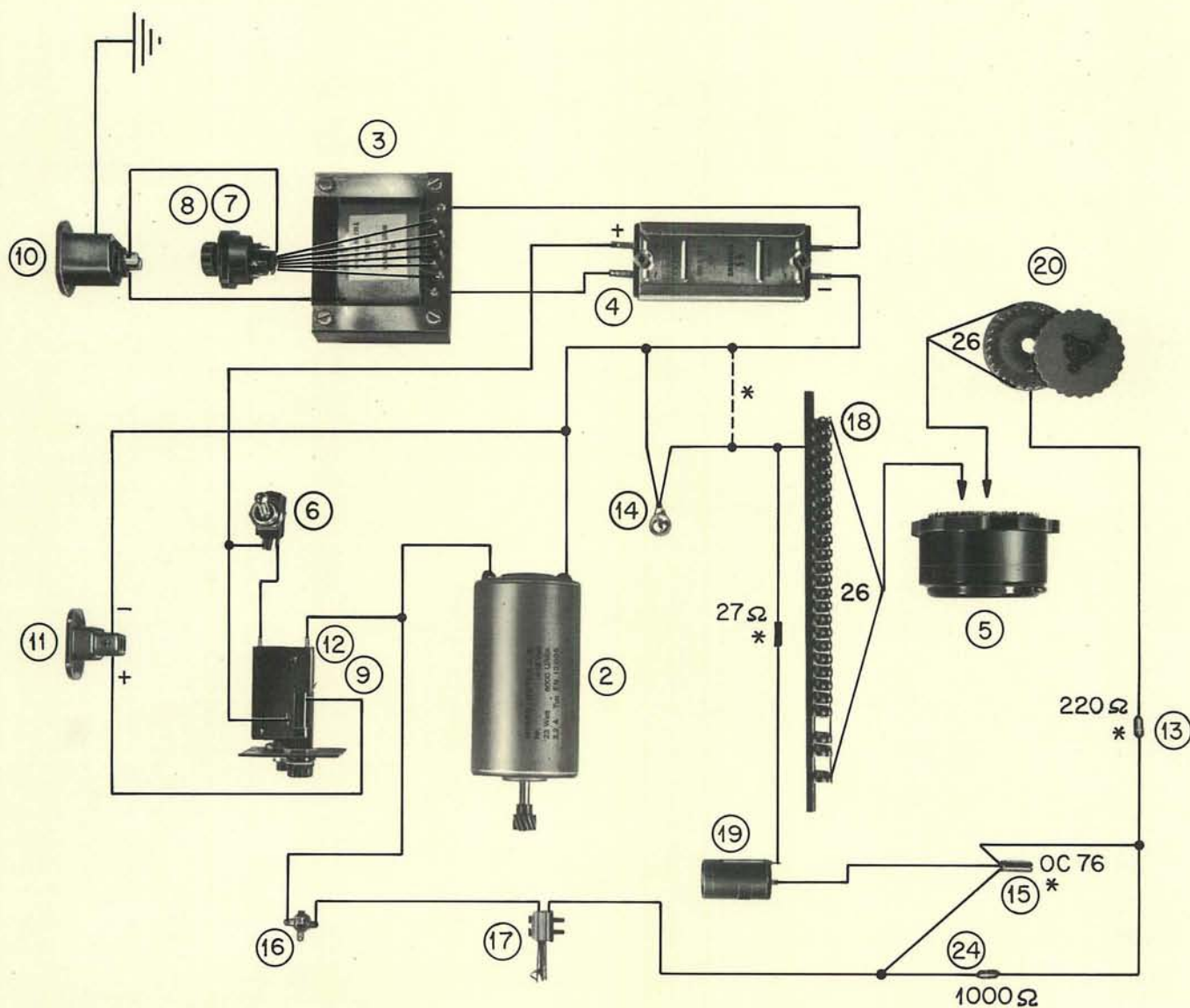


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Fig. 37



* For } S 404 215 { change } { 220 } → 1200 Ω
 Pour } { échangez } { OC 76 } → OC 80
 Für } { ändert } { Thermistor } → 27 Ω { new place
 (14) { } { } { } { cablage modifié
 { } { } { } { andere Verdrahtung

S 404 054

Wartungsanleitung
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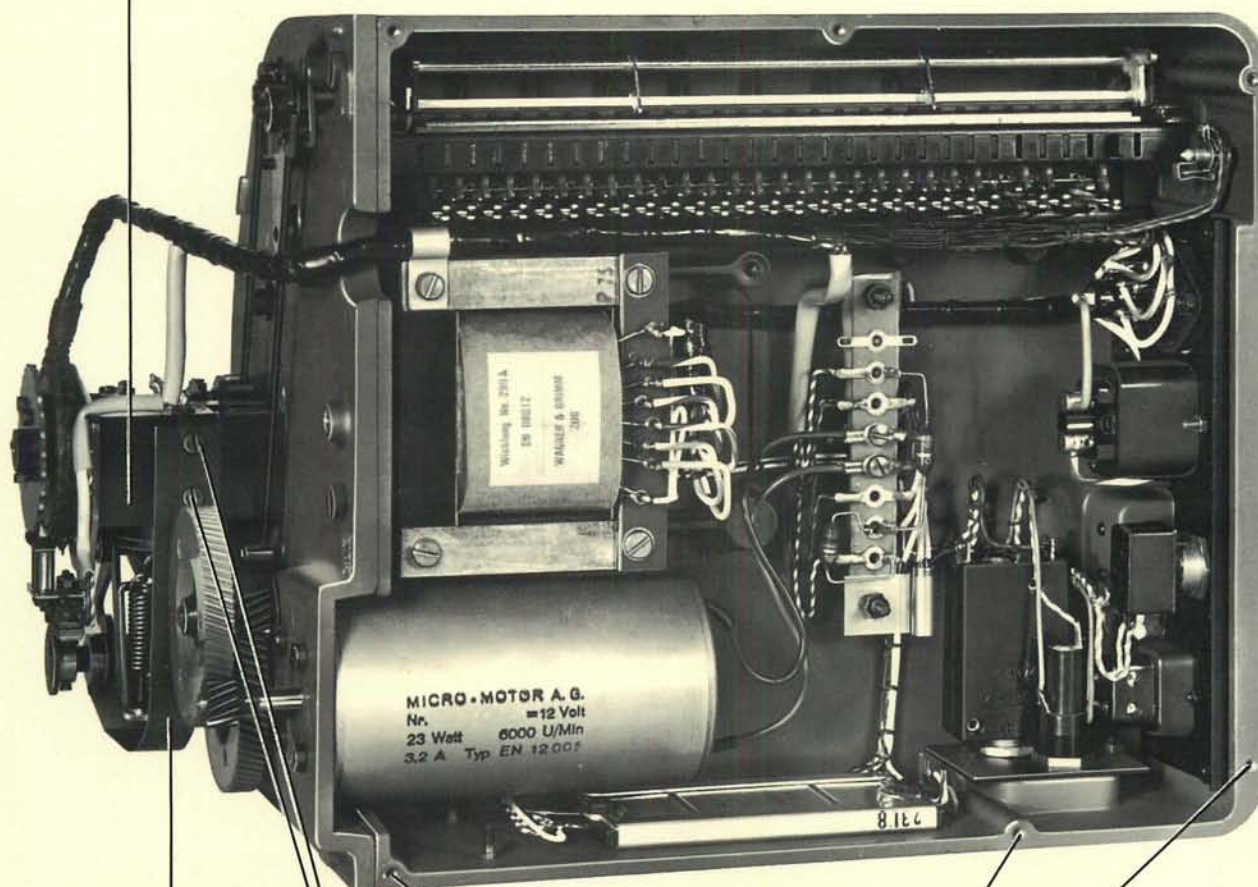
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Fig. 36

CRYPTO AG. ZUG (Schweiz)

408 626



408 889

ZK M3 x 3

SK M3 x 5

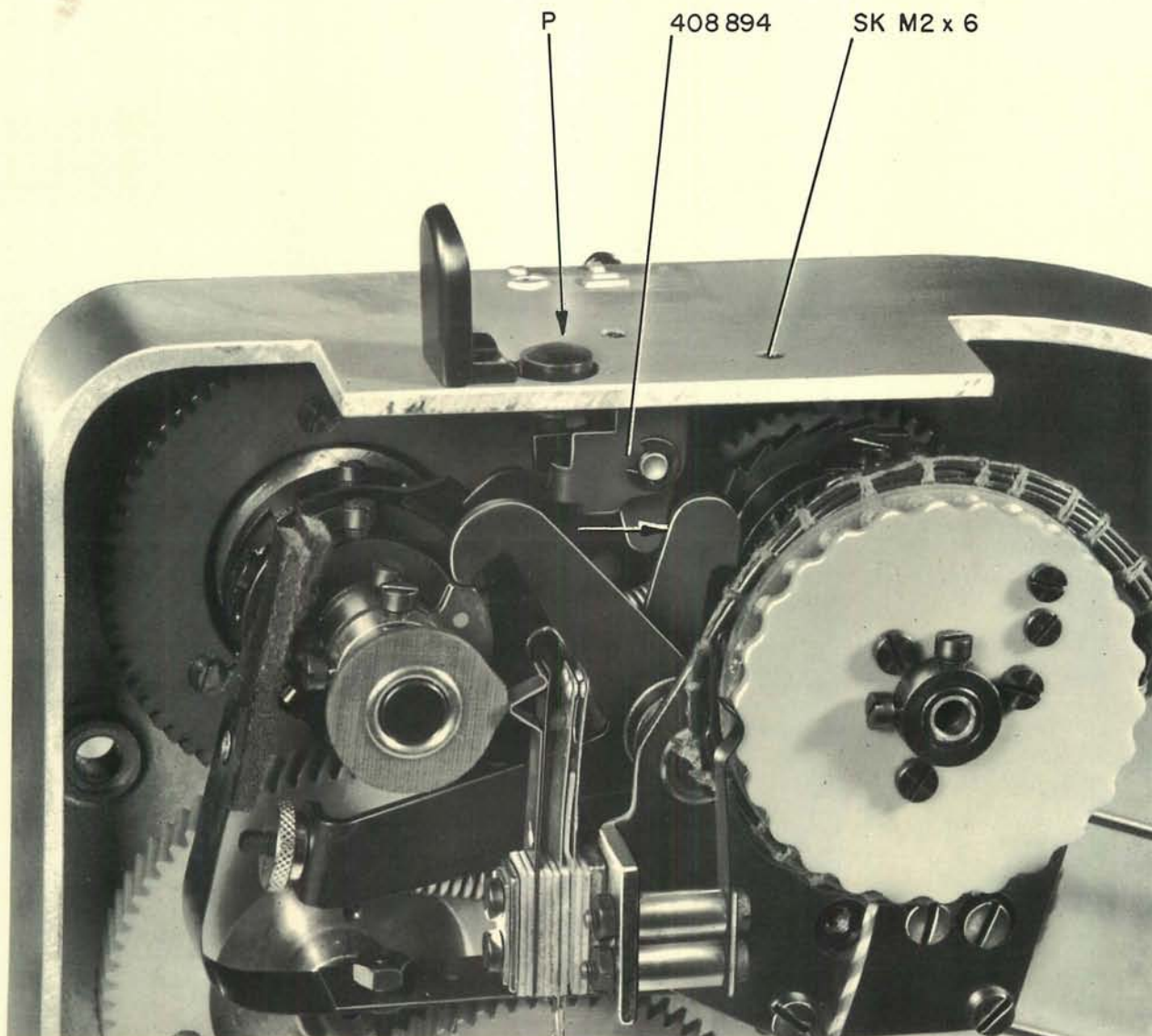
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Fig. 35



Wartungsanleitung
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Fig. 34

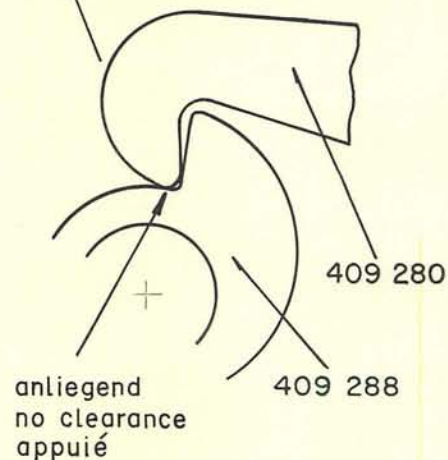
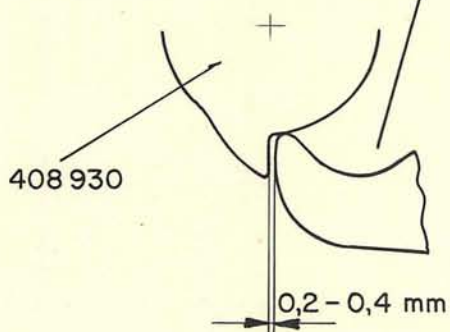
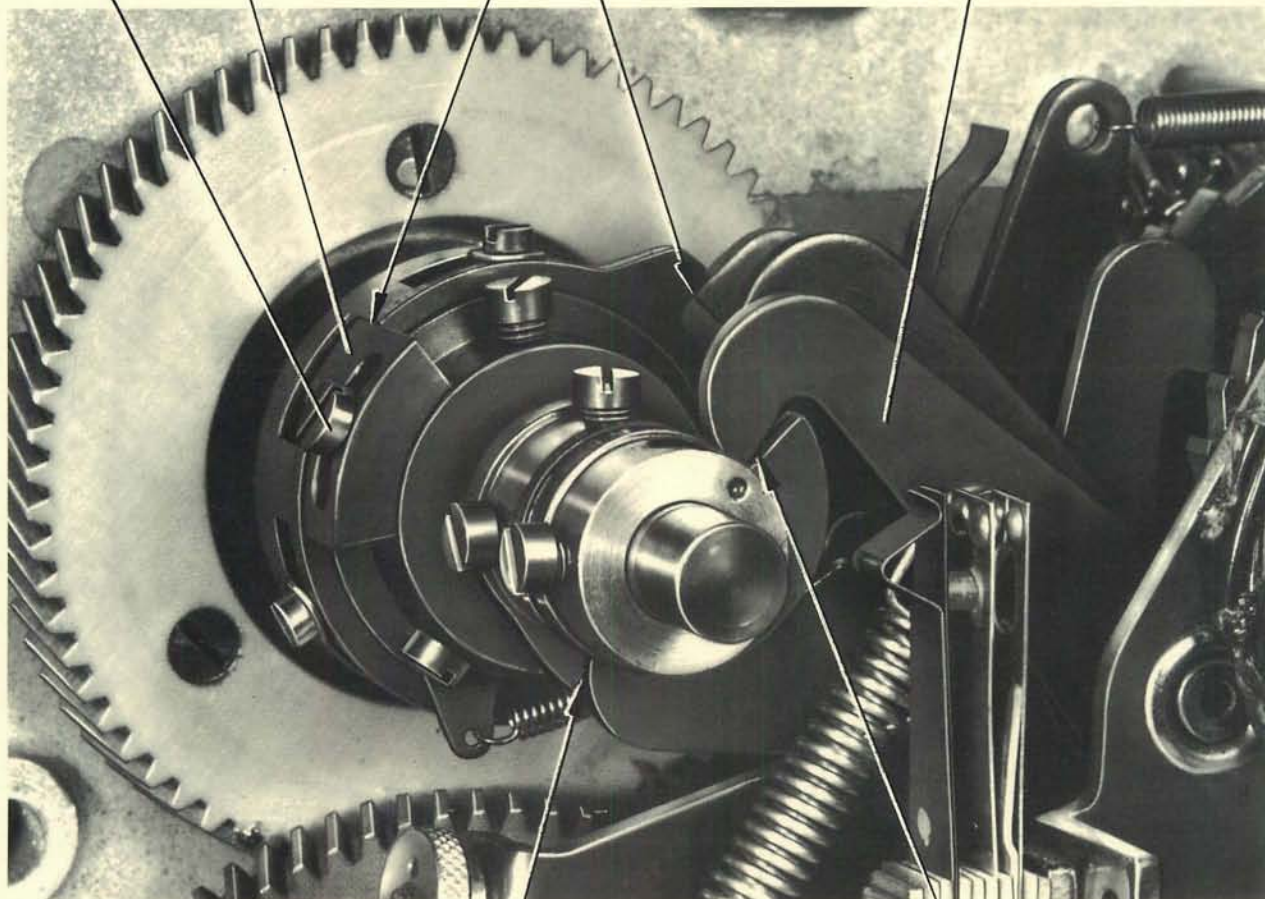
408 589

M2,3 x 8
VSM 12 182



angeschlagen
no clearance
appuié

409 280



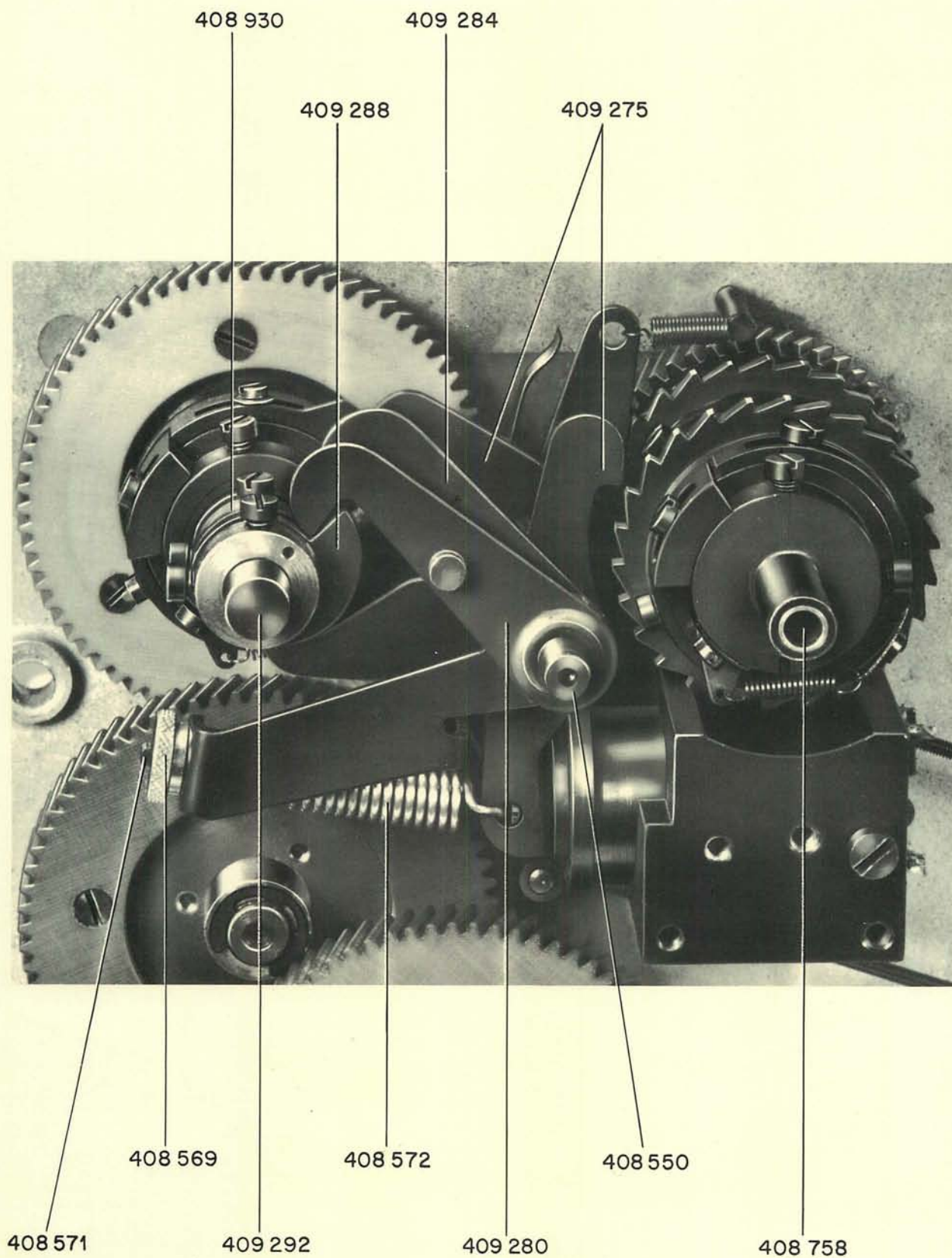
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Fig. 33

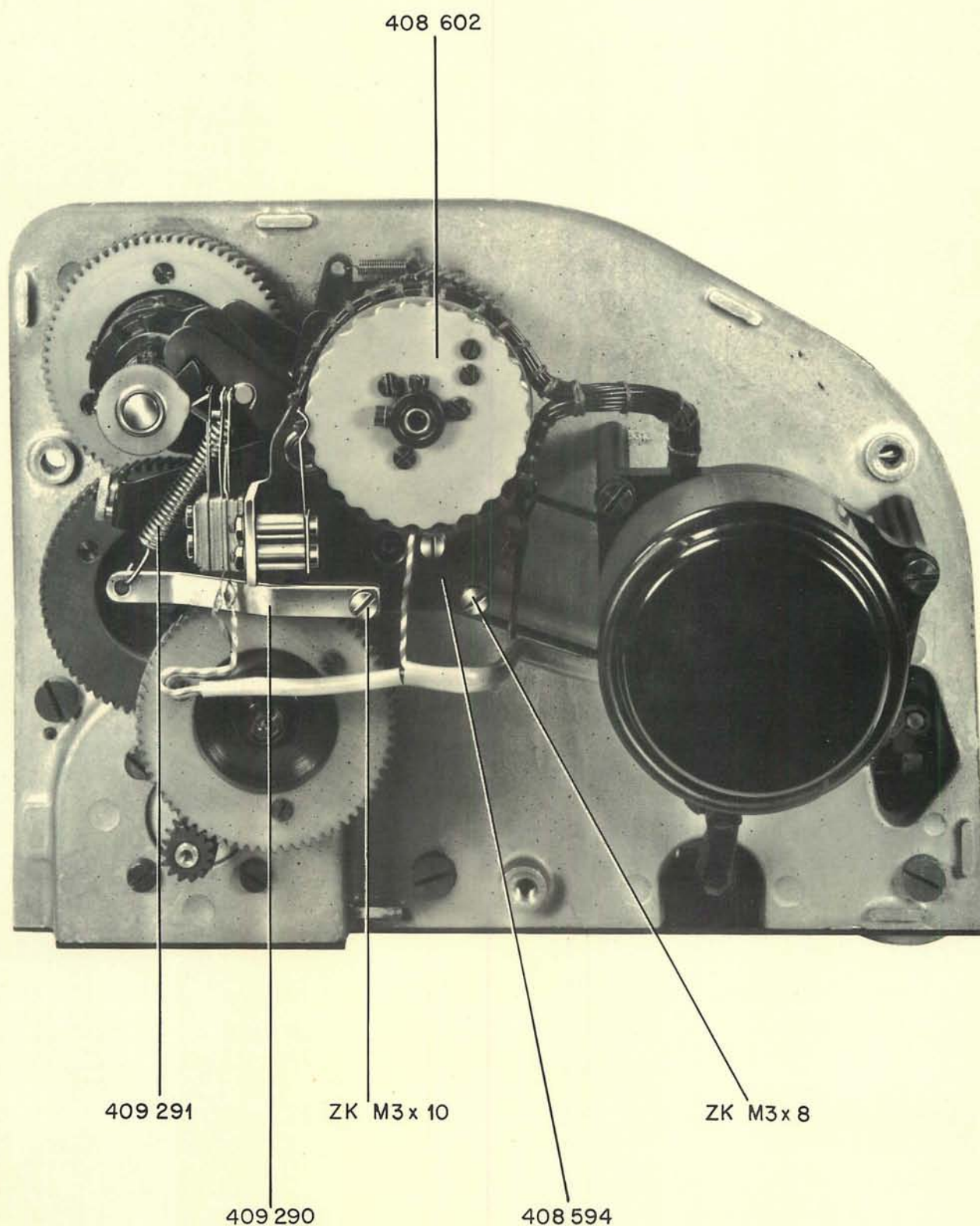


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Fig. 32

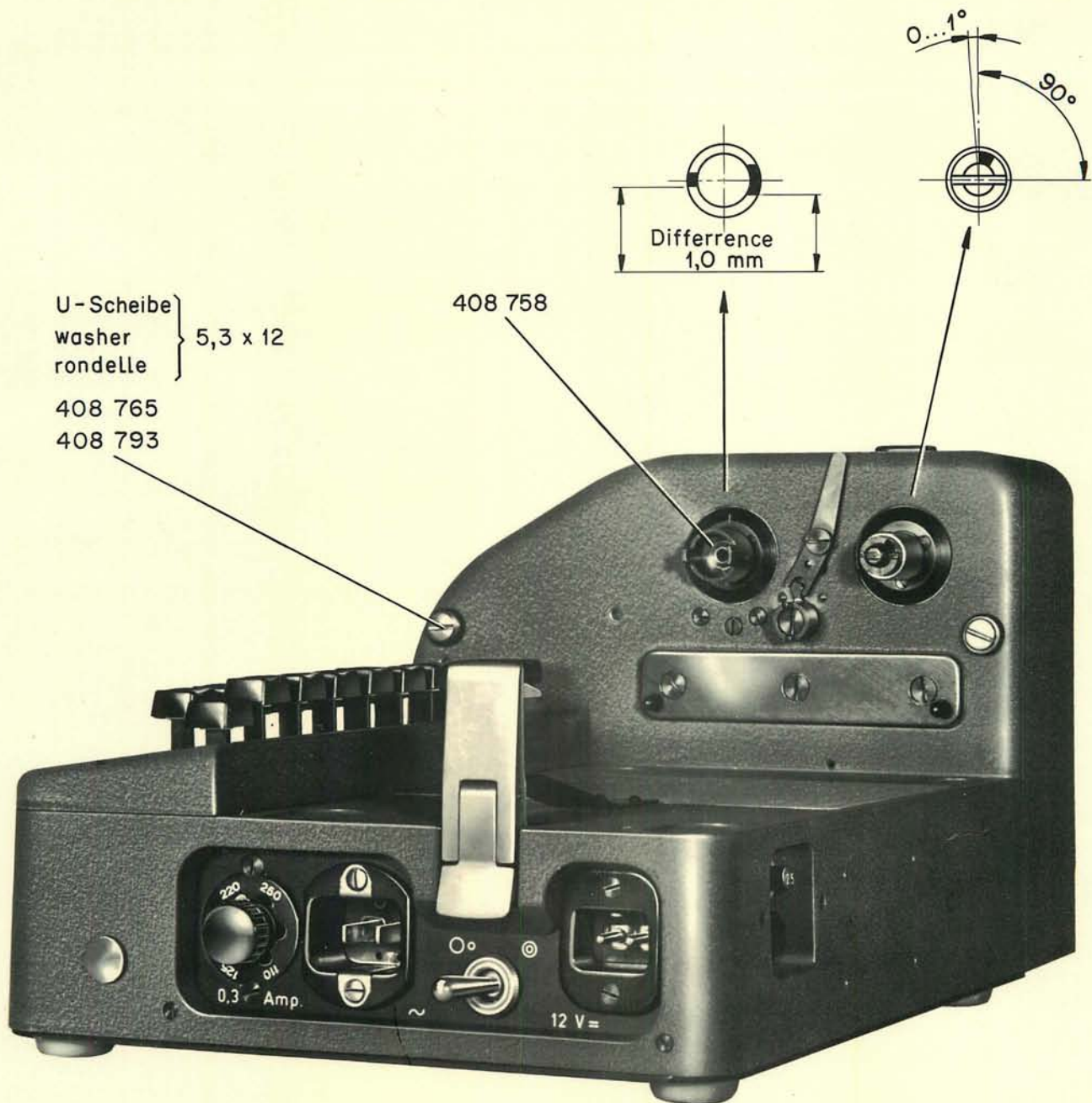


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Fig. 31



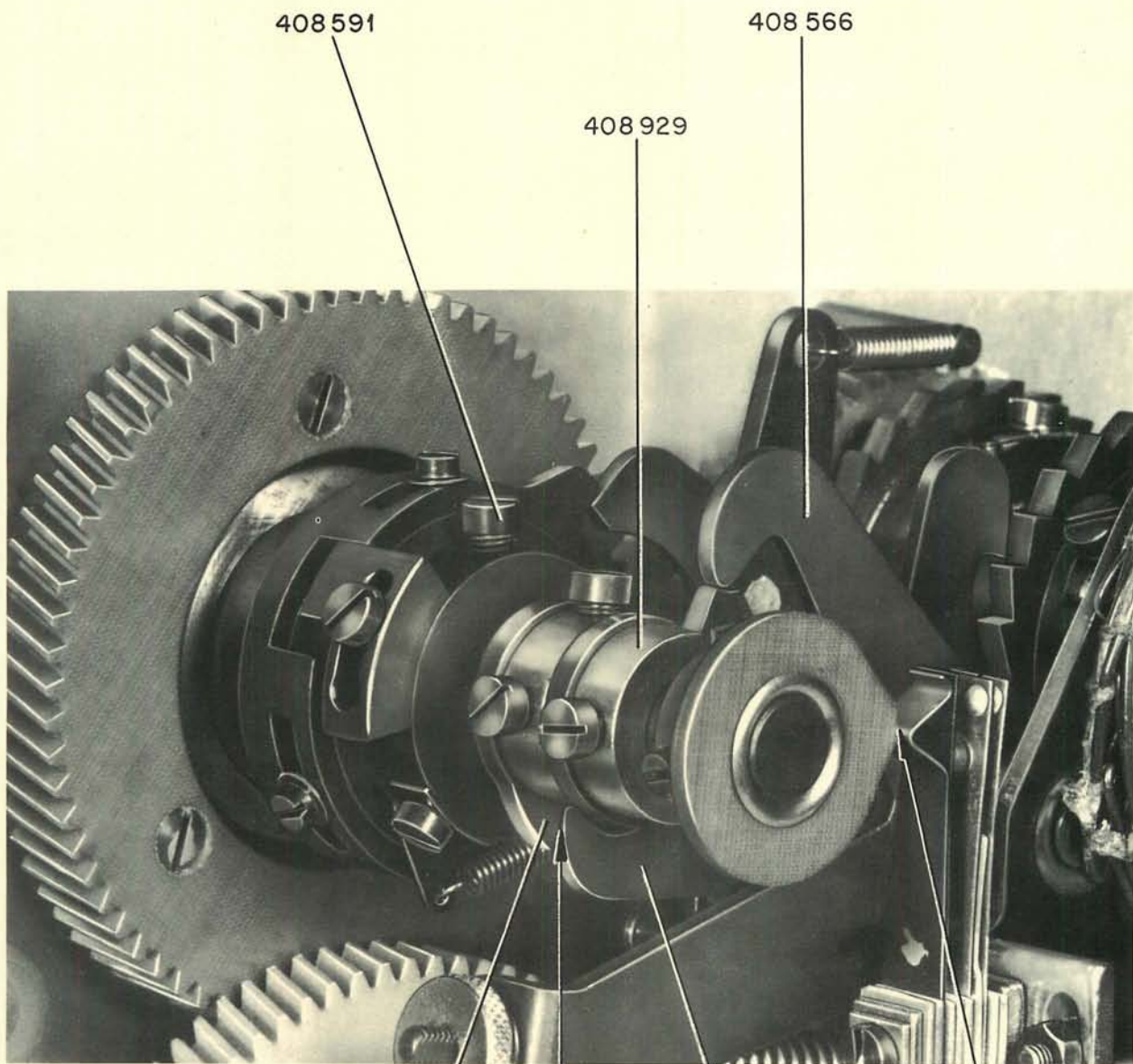
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Fig. 30

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408 591

408 566

408 929

408 552

408 930

0,2-0,4 mm

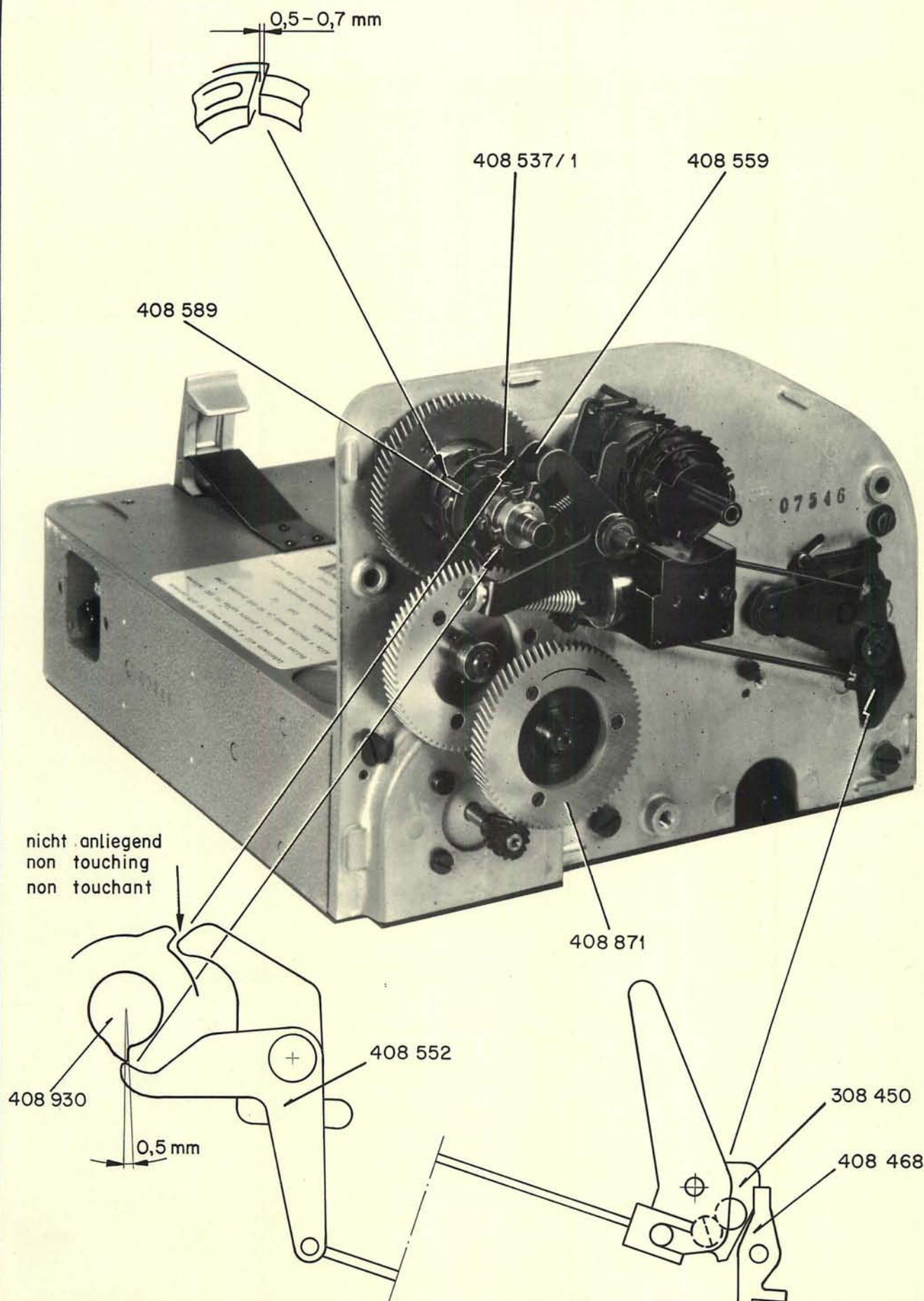
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Fig. 29

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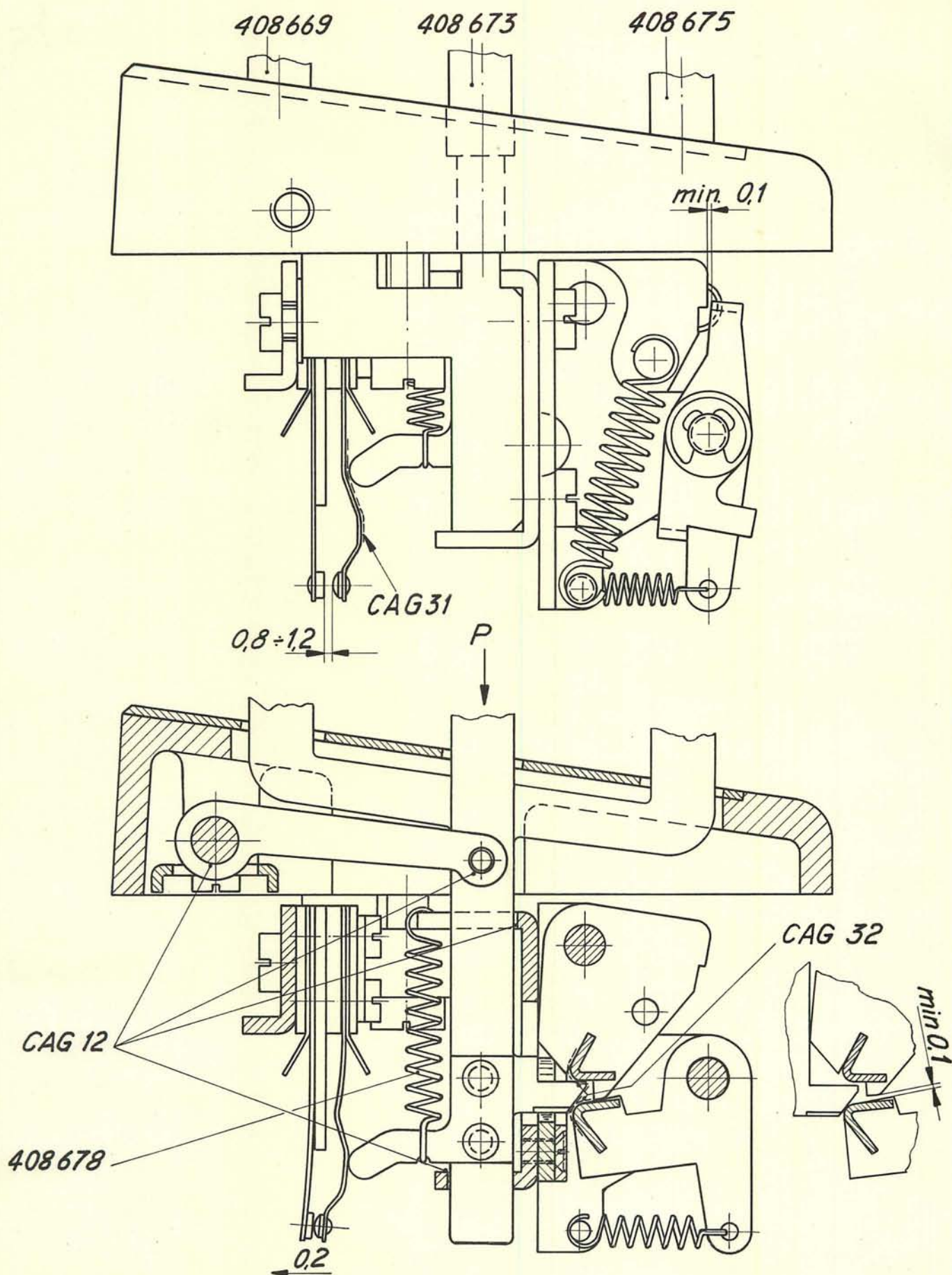
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Fig. 28



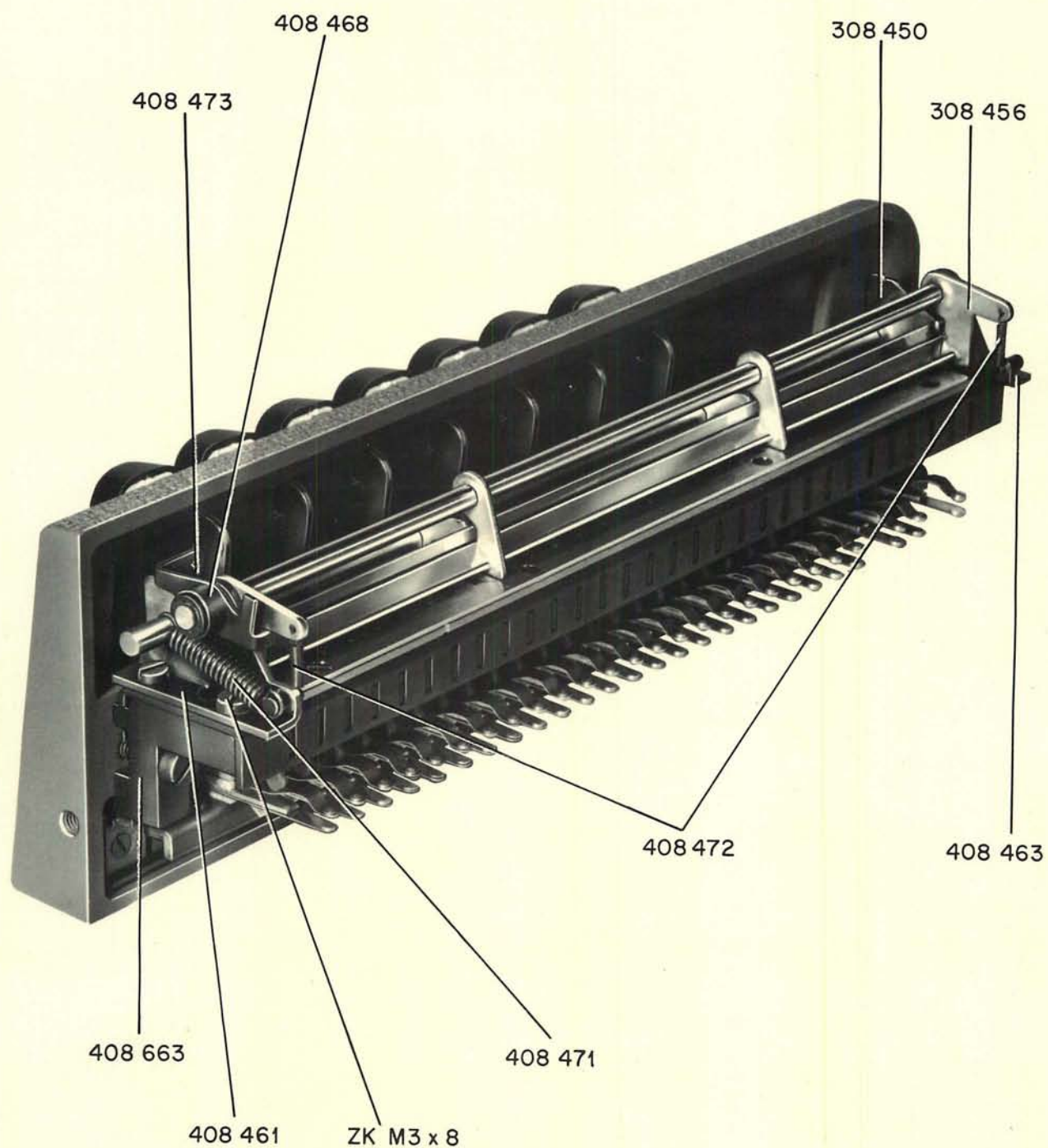
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Fig. 27

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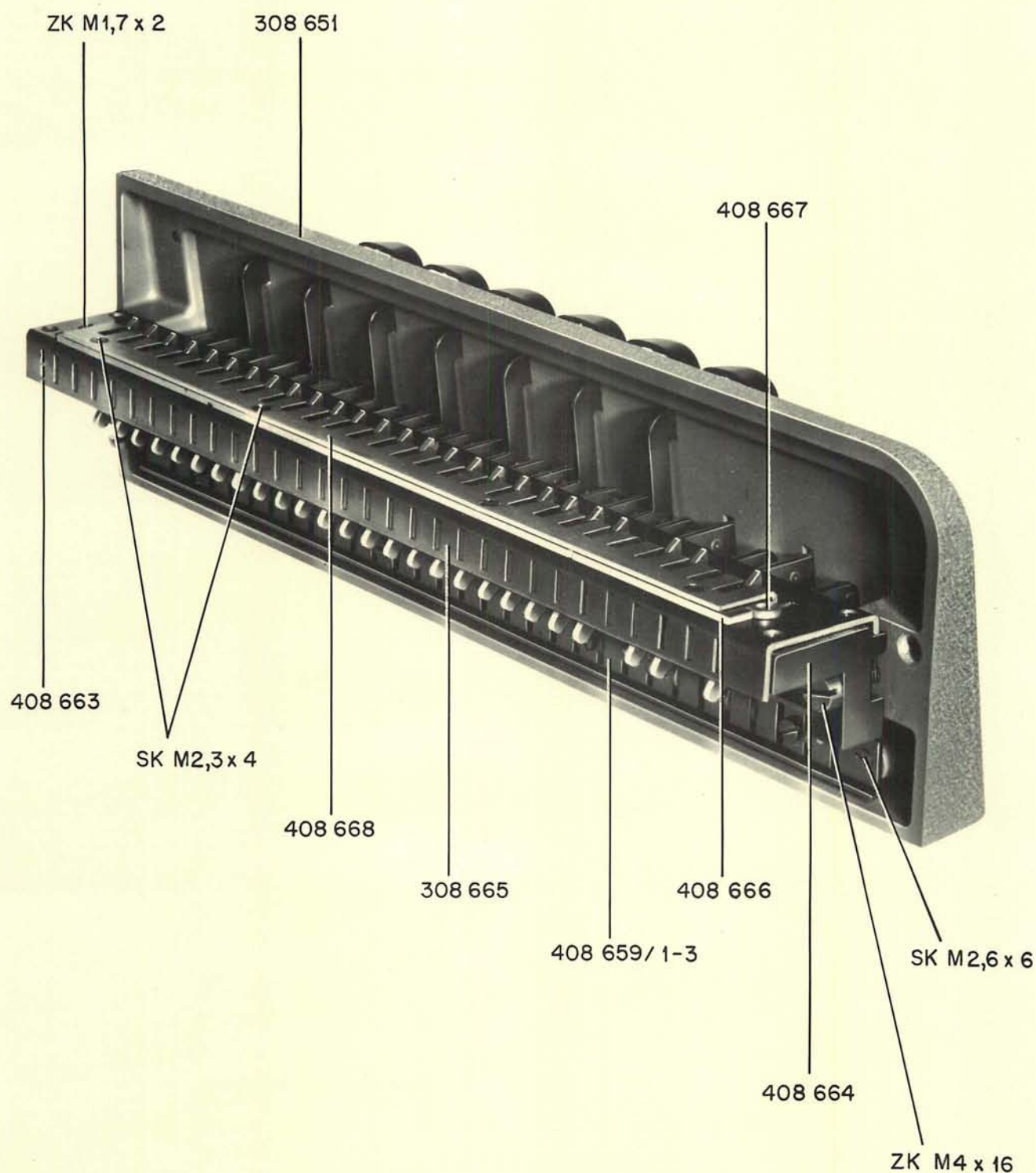


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Fig. 26



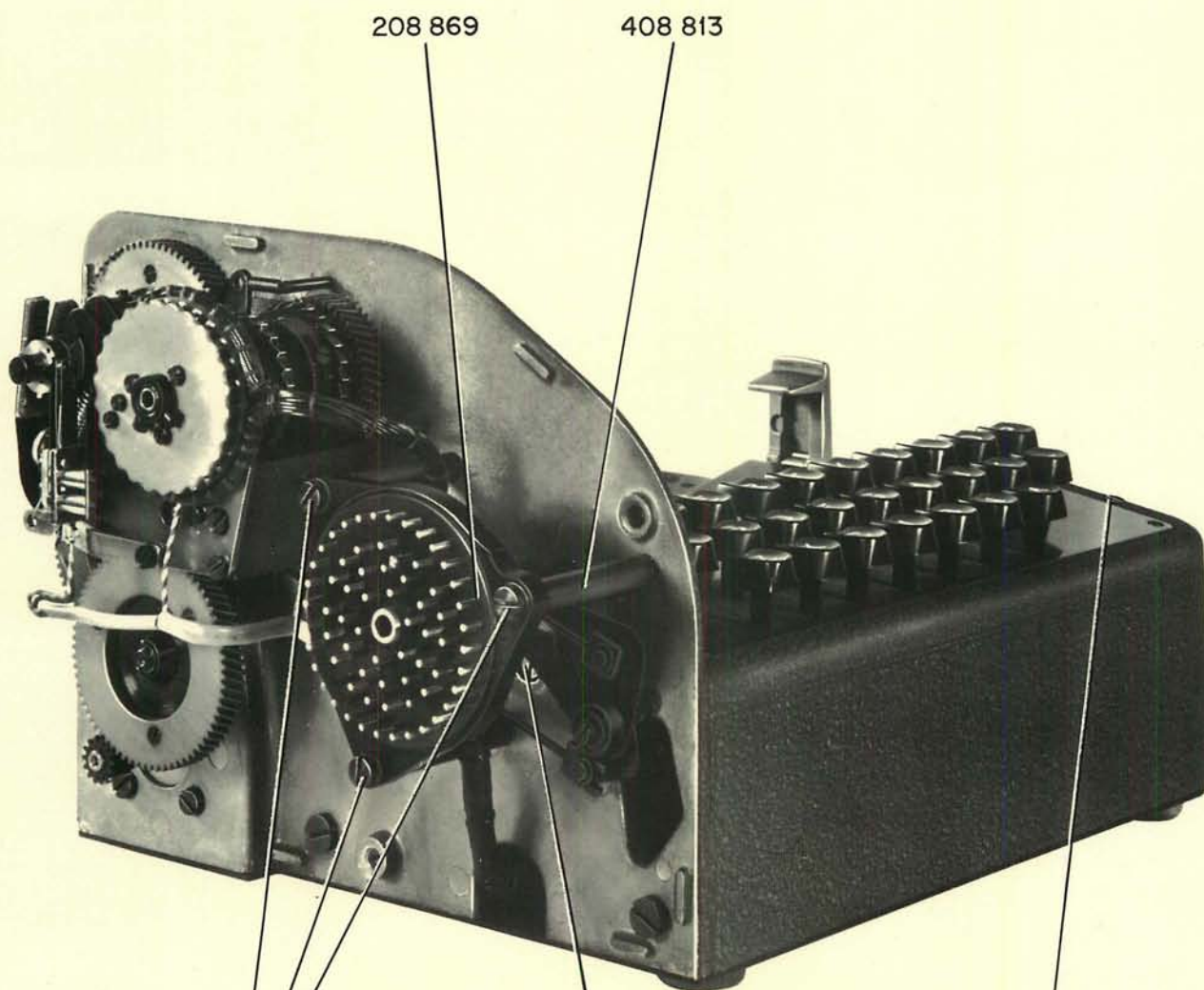
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Fig. 25

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ZK M4 x 52

S - Scheibe
spring washer } 4,3 / 8
élast. rondelle }

U - Scheibe
washer } 408 812
rondelle }

ZK M4 x 6

ZK M4 x 14

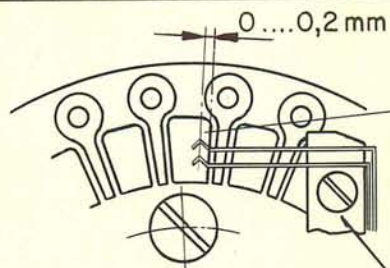
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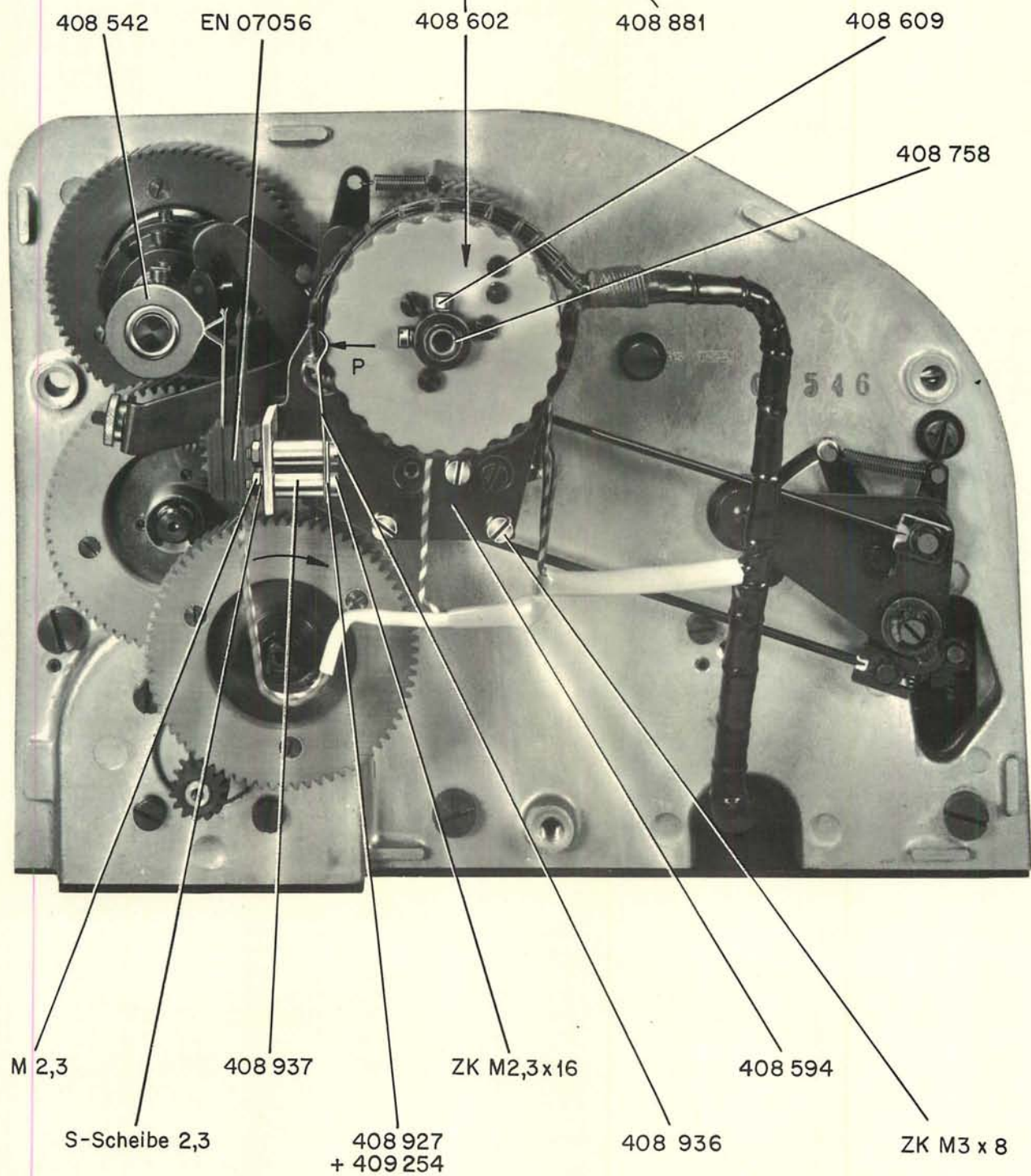
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Fig. 24

CRYPTO AG. ZUG (Schweiz)



Bürstenvorspannung
bending of free brush
balais libre pretension } 0,4-0,6 mm

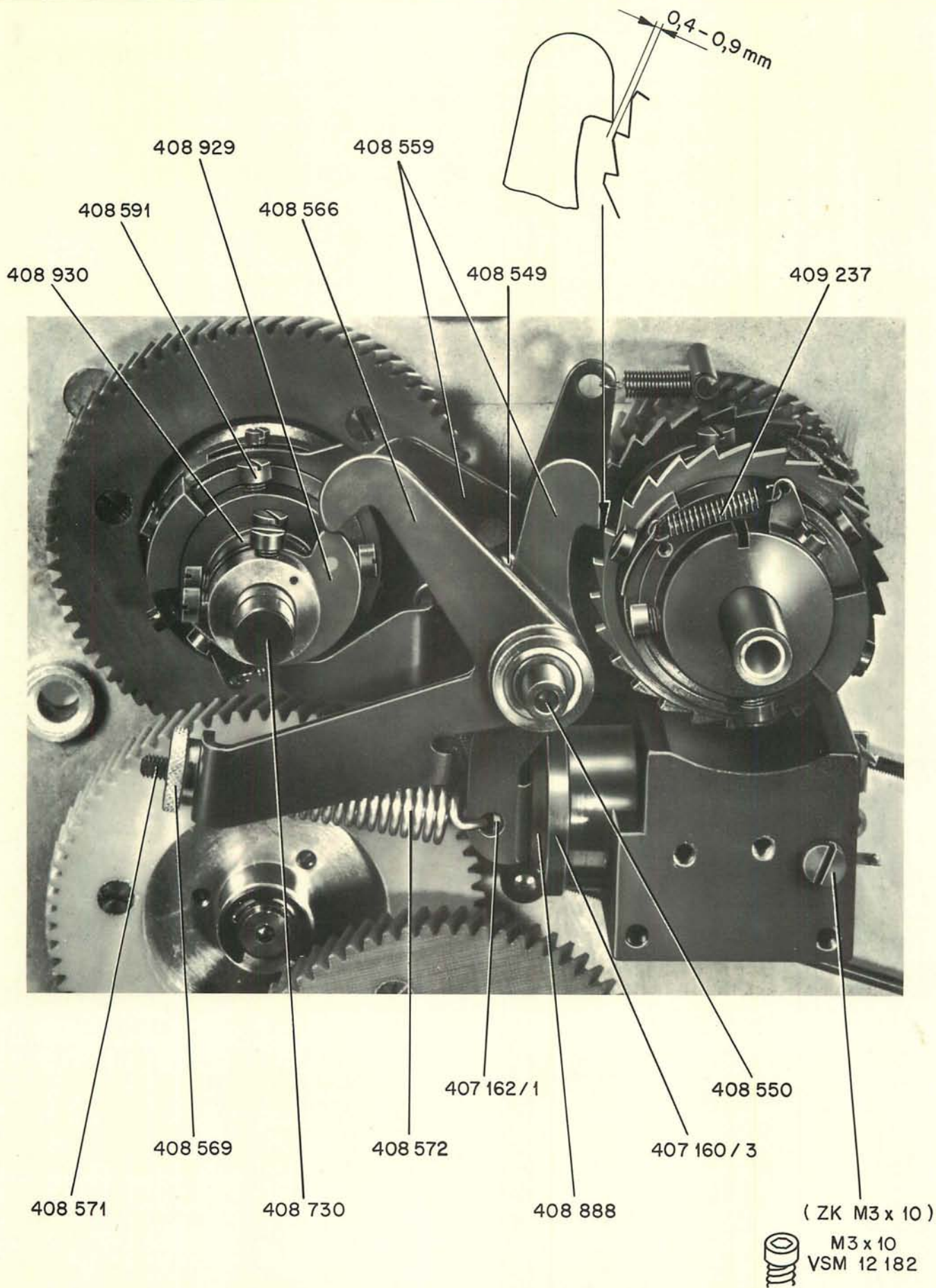


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Fig. 23



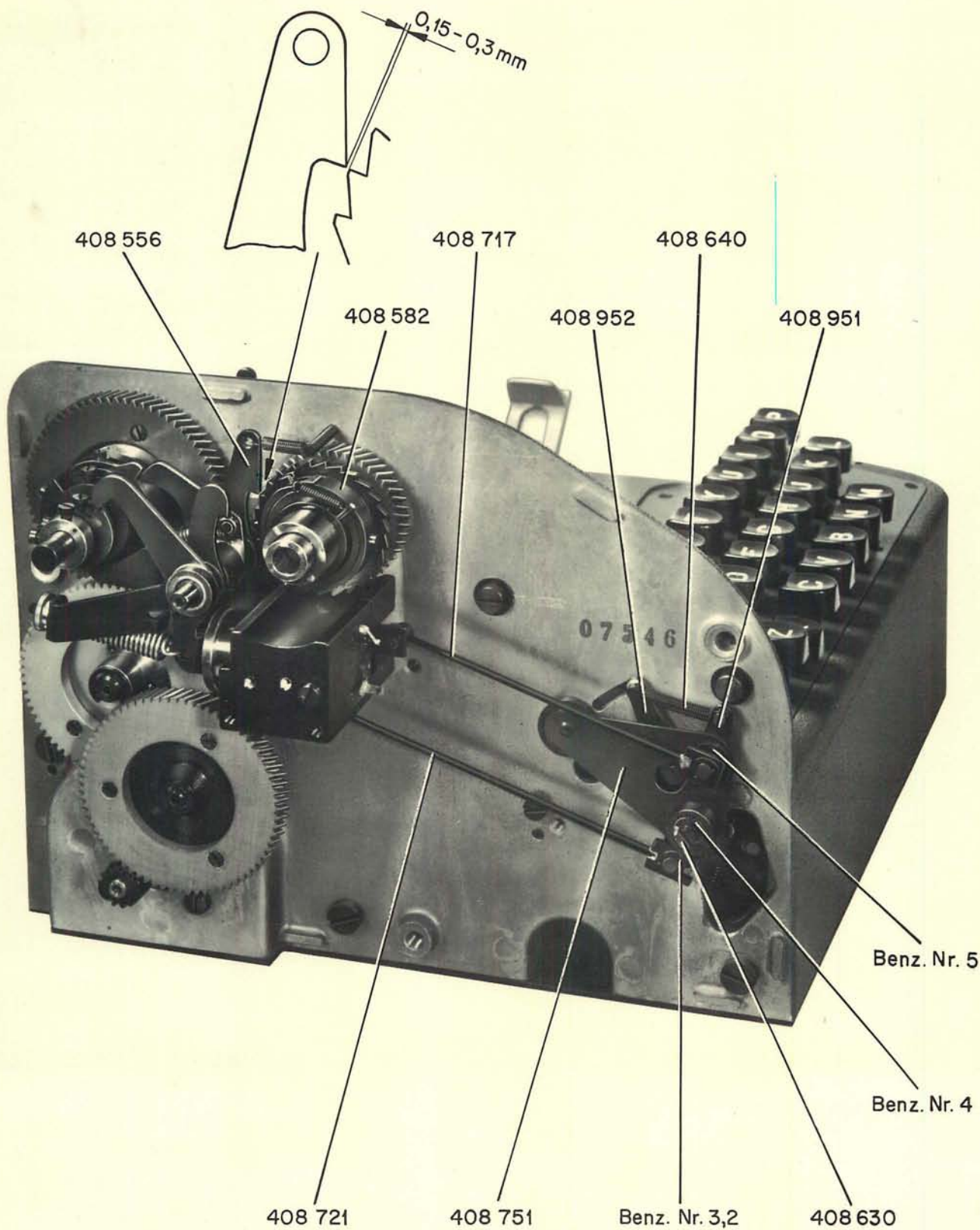
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Fig. 22

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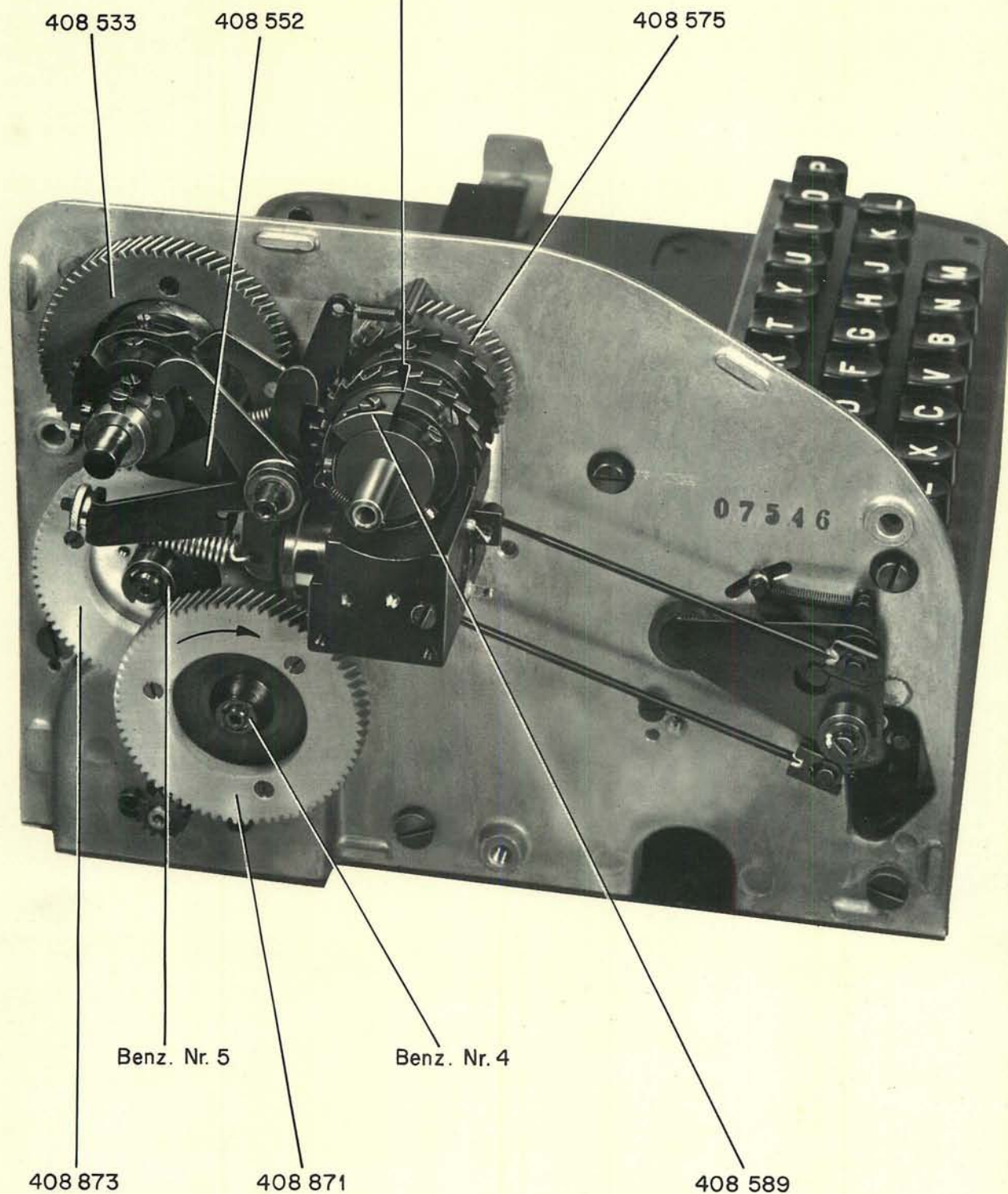
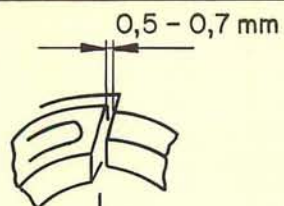
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Fig. 21

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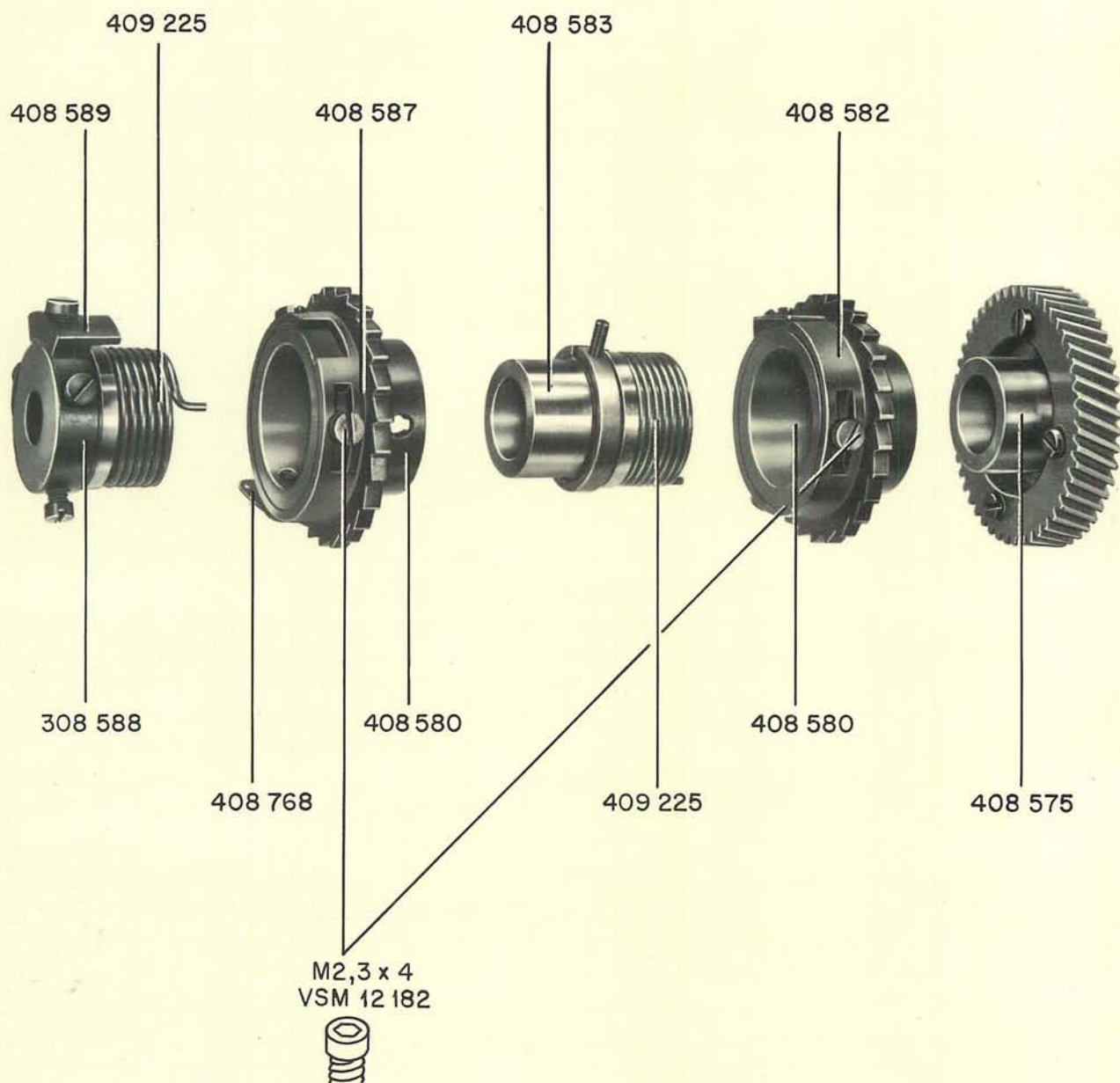
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Fig. 20



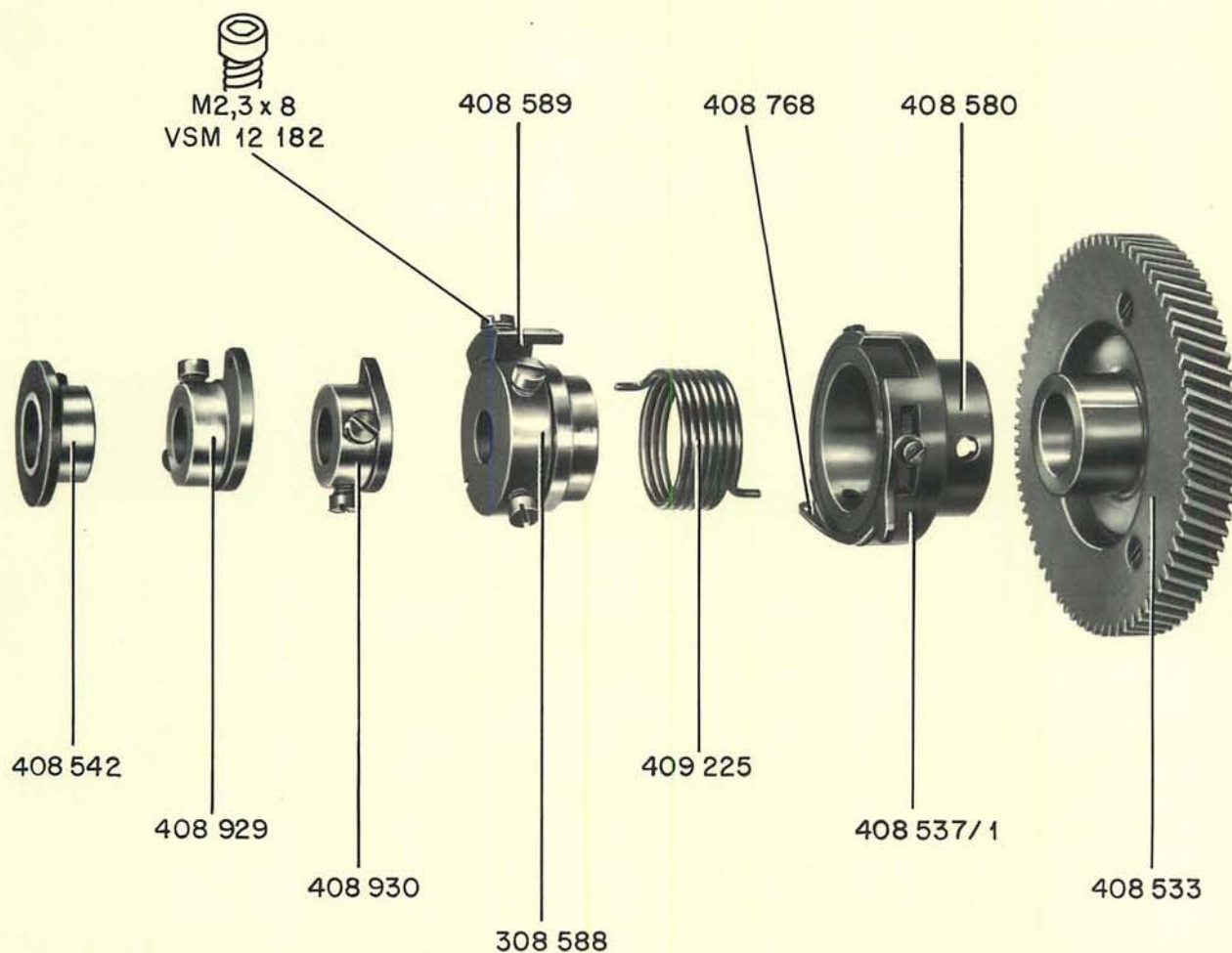
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Fig. 19



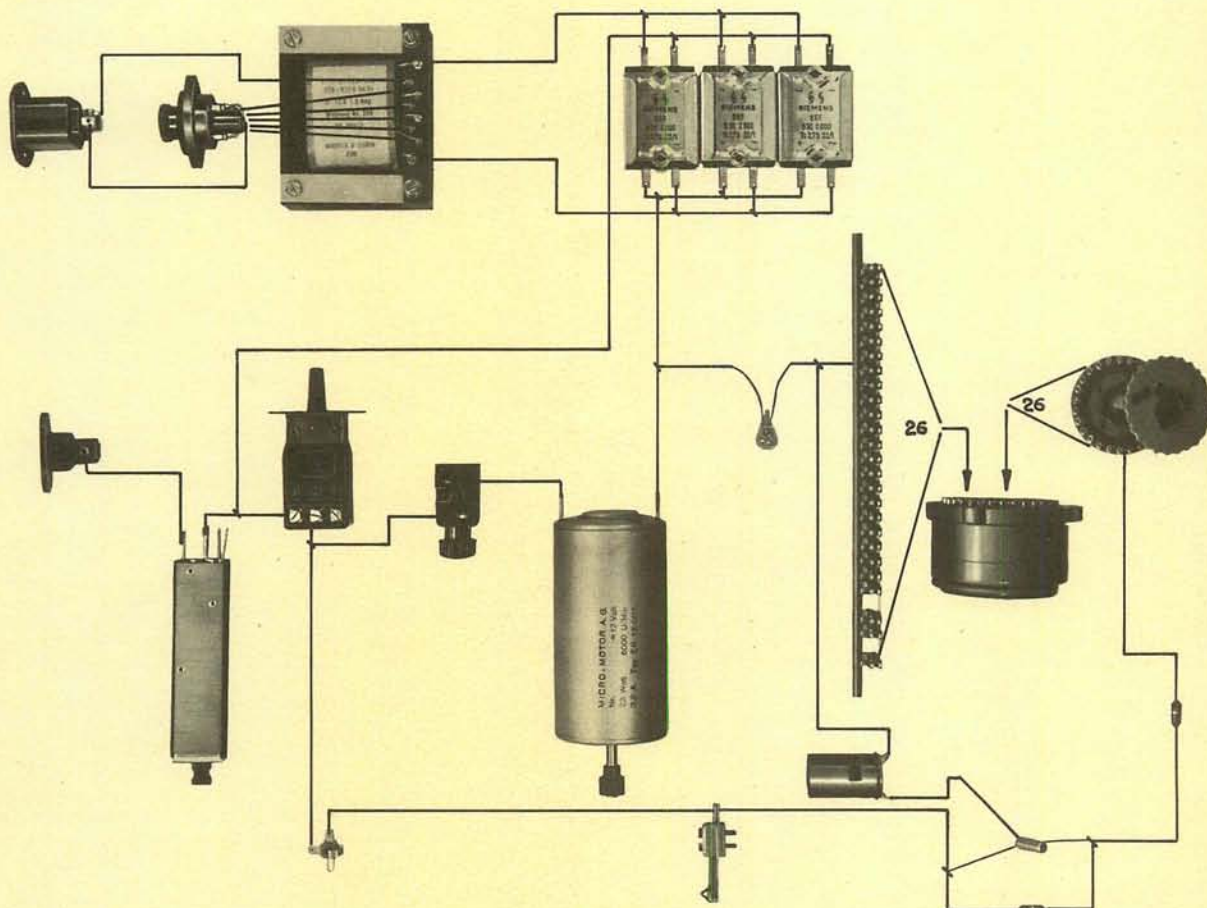
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Fig. 18



(S-404 027) ^{oder} _{or} (S-404 028)

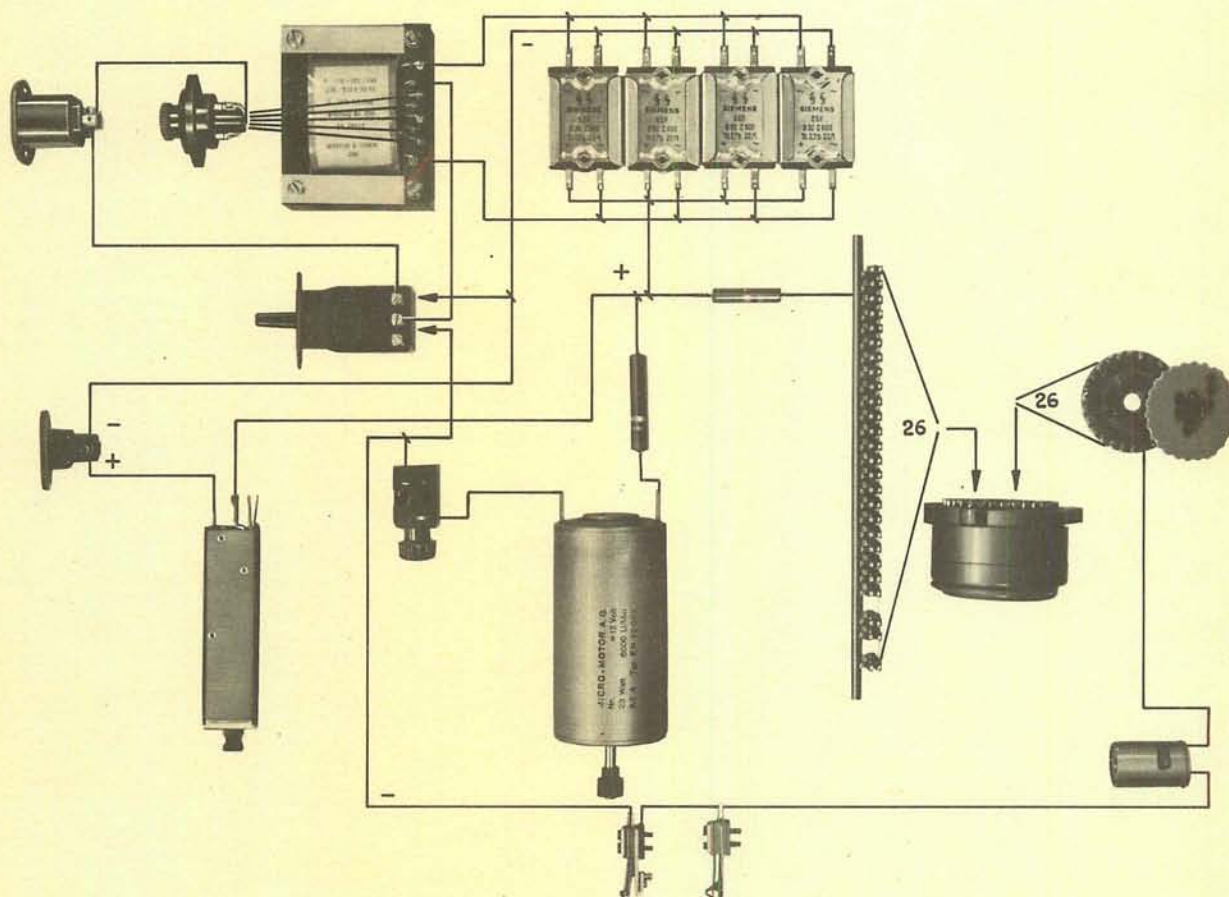
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Fig. 17

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(S-404 o23) oder (S - 404 o24)
 or
 ou

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Fig. 16

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Fig. 1

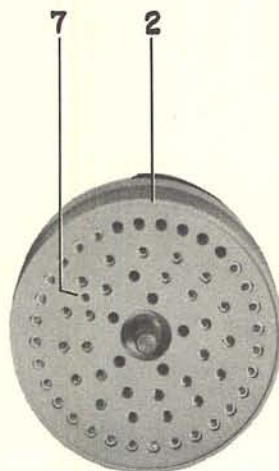


Fig. 2

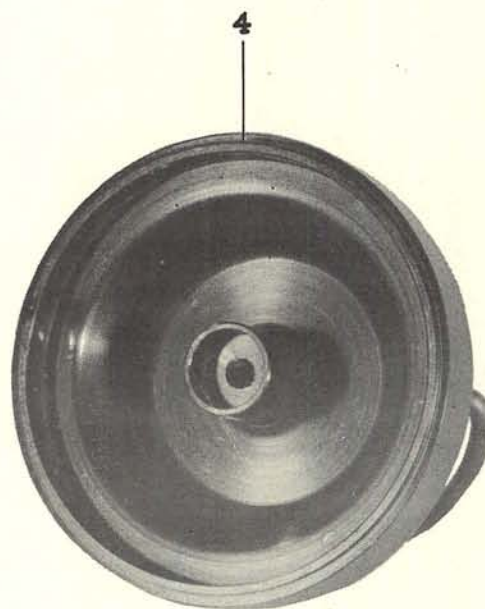
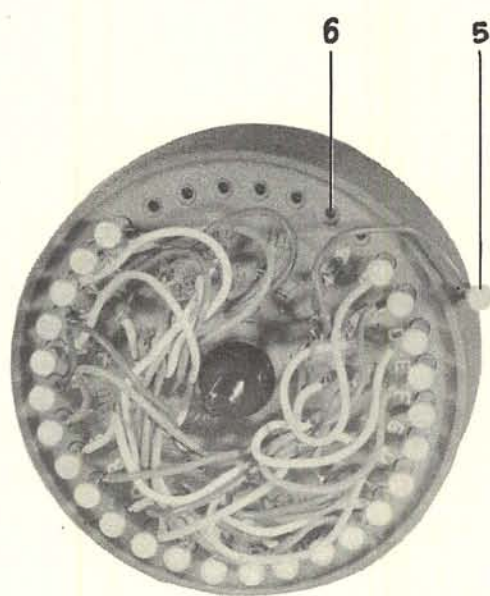
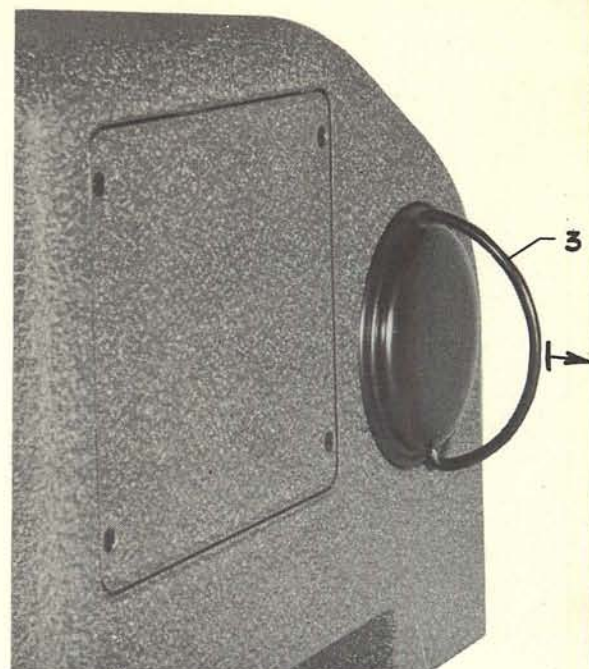


Fig. 3

Setzanleitung zu Modifikatoren
Instruction de préparation pour mod.
Setting instructions for modifiers

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Fig. 1, 2, 3

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