

information



RUHLA-ELECTRIC

Electromechanical
Wrist Watch Cal. 25

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1. Introduction

This instruction book is mainly intended for watchmakers but trade experts, too, will find interesting information in section 2 about the operation of the first electric wrist watch produced in the GDR. The instructions concern operation, repair and maintenance of the RUHLA-ELECTRIC (Cal. 25).

2. Design and operation

The RUHLA-ELECTRIC is driven by a contact-controlled balance motor designed on the electro-dynamic principle and supplying power via the controlling gear to the watch work and thus to the hands. Energy is supplied to the balance motor by a button - type cell providing a constant voltage of about 1.5 V for a period of at least 12 months.

An iron free coil 1 is level-mounted in balance 2 and swings over two fixed permanent magnets 3 (see Fig. 2).

When the coil is above the magnets, the circuit is closed through switch pin 4, contact wheel 5, and contact spring 6. Immediately prior to a switching operation the circuit is again interrupted, and the balance swings through the complementary arc.

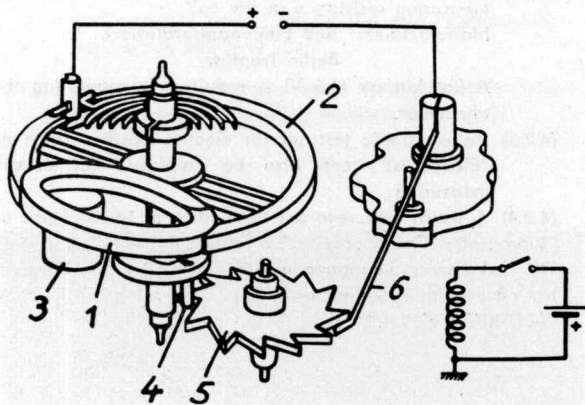


Fig. 2

The contact remains open during the return movement of the balance, which is only supplied with one impulse per full amplitude. A small stop magnet engaging a control wheel made of a magnet-responsive soft material and fixed to the contact wheel serves to arrest the contact wheel securely.

Two return circuit devices are arranged above the balance and below the magnet; they serve to increase efficiency and shield the lines of magnetism. (For better survey the return circuit devices and the second magnet have been left out of the diagram.) All other mechanical construction

members correspond to those of a traditional spring-wound watch; further information concerning its function is therefore unnecessary.

The RUHLA-ELECTRIC does not possess a winding mechanism. There is a so-called catch lever additionally mounted on the right-hand side; it is operated by the rocker and blocks the movement in hand position when the crown is pulled out, at the same time opening the circuit. When the watch is not used it can therefore be put away with the crown disengaged, in order to preserve the element. This will principally be the case when the watch is kept in store. The watch is supplied by the manufacturers with a protection device placed between crown and case; it has to be pulled out to permit the crown to be pushed in.

Since the watch work serves only to transmit the rotary motion to the hands, slight tampering errors will not influence movement results.

Bearing pressure is insignificant compared with that of spring-wound watches, and bearing wear need not be feared.

3. Source of power; connections

The balance motor is energized by a button-type cell whose working voltage is 1.5 V. The manufacturers employ silver oxide cells of sufficiently high capacity, though Leclanché cells can also be used if their outside diameter does not exceed 11.5 mm and their plus terminal is at the element casing. The minus terminal must be placed, the same as the original cells, in the centre of the element cap. The discharging diagram of the silver oxide cells is shown in Fig. 14.

It should be noticed that silver oxide cells (of type WS 12) are to be stored at normal room temperatures and atmospheric humidity. Excessive temperatures of up to 30°C. (in shop windows, for example) will be endured for a period up to 4 weeks without any damaging results. They should under no circumstances be subjected to abrupt temperature changes, as a layer of moisture can lead to the partial or even complete discharge of the cell. When a cell of type WS 12 is inserted it should be kept in mind that the crescent-shaped insulating disc 1-25-82-408.0-00 must first be placed underneath. The insulating disc prevents a short circuit after the cell has been inserted. The minus terminal of the cell is to be placed towards the dial side. The element is kept in position by an element-retaining spring on one side by means of a fork catching in a grooved pillar. The other fork side of the spring is maintained by a flattened screw, which engages or disengages, respectively, the spring at a quarter turn. Care should be taken not to touch the contact surfaces with fingers.

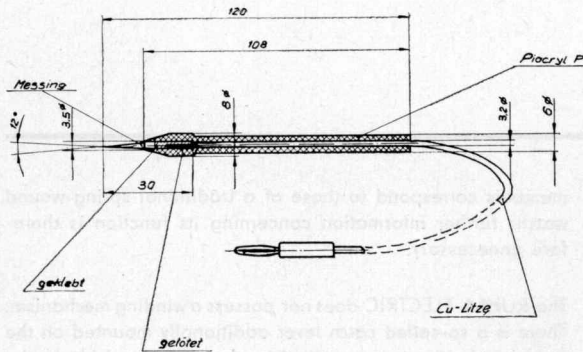


Fig. 3

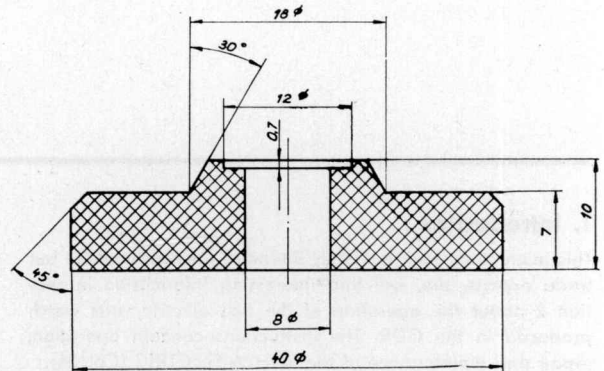


Fig. 4

4. Tools and measuring instruments required for repairing the RUHLA-ELECTRIC (Cal. 25) - recommended material

(4.1) Tools

- (4.1.1) Work-retaining device, for works of size 27 mm diam.
- (4.1.2) Anti-magnetic spiral pincets
- (4.1.3) Two insulated feeler tips, according to Fig. 3 (easily self-made)
Boring in acrylic glass body, coloured with red or blue ink.
- (4.1.4) Receiving ring for balance, according to Fig. 4
- (4.1.5) One or two charged button-type cells
- (4.1.6) Tongue for stop magnet, without magnet, with cap jewel
- (4.1.7) Ordinary watchmakers tools
- (4.1.8) Glass-removing device (for cases with wide visual field)

(4.2) Measuring instruments

- (4.2.1) Universal measuring instrument II for current and voltage measuring; item stock number 316 870; voltage range 0 to 1.5 V = current range 15 μ A.

Manufacturers: VEB Elektroapparatewerk
Berlin-Treptow

In case of current measuring, the universal measuring instrument II must be employed in connection with a monocell (e. g. of type EJT 1.5 V) and an electrolytic condenser. Polarity (plus and minus) will have to be taken into account in the case of the watch, the instrument, the monocell, and the condenser (see Fig. 5).

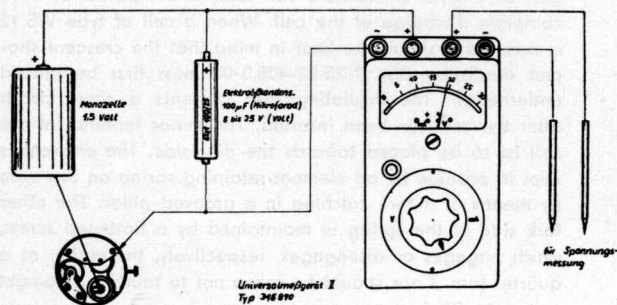


Fig. 5

It should be kept in mind that

- (1) the watch must start at once because of the high peak current loading the instrument;
- (2) a short circuit, which might damage the instrument, will have to be strictly avoided. A contact head, corresponding to Fig. 6, will permit definite and short-circuit proof measurement of the integrated current.

The contact head, which can easily be manufactured, is inserted in the watch instead of the element. Besides measuring the current, the universal measuring instrument II allows a conditionally correct judgment on contact quality. If, for example, the pointer drops away periodically during the current measurement, this is an indication that one or more teeth of the contact wheel are dirty or ineffective.

- (4.2.2) Portable ohmmeter; item stock number 316 866, for measuring resistance at the coil.

Manufacturers: VEB Elektroapparatewerk
Berlin-Treptow

A flat battery (4.5 V) is required for operating the ohmmeter.

- (4.2.3) An electronic test set for electric watches (such as "Electrotest") can also be employed for current measuring.

- (4.2.4) A watch rate recorder for a rate of 18,000 (such as "Vibrograf", "Chronographic", or others.)

The instruments mentioned in 4.2.3 and 4.2.4 are, however, not necessarily required for repairs concerning the RUHLA-ELECTRIC (Cal. 25).

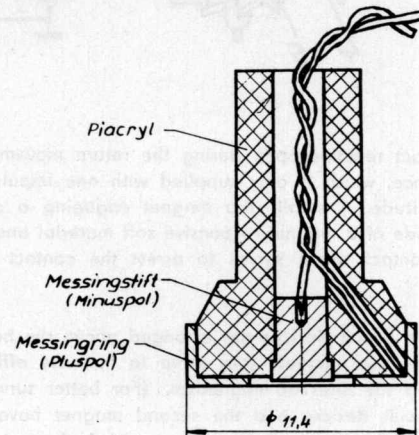


Fig. 6

5. Removing the work

The waterproof case is provided with a sealing cap, which can be removed in the usual way with a case opener.

When the work-retaining ring has been removed, the bent lever screw is to be released and the crown pulled out. The complete work can now be taken out of the case.

When the work is being removed from cases with a wide visual field, the glass will have to be lifted with a glass-removing device. The work can then be taken out of the case from the dial side.

6. Inspecting the work

We recommend the following sequence of operations for a comprehensive inspection:

- Disassembling
- Replacing the defective members
- Cleaning
- Reassembling, with concurrent checking
- Final check
- Installation in the case

(6.1) Disassembling

- (6.1.1) Release the spring retaining the button-type cell; remove the cell.
- (6.1.2) Lift off the seconds and minute hands; release the dial-retaining screw; lift off the dial together with hour wheel and hour hand.
- (6.1.3) Release the lower yoke screw lift off the lower yoke together with the working magnets (see Fig. 7).

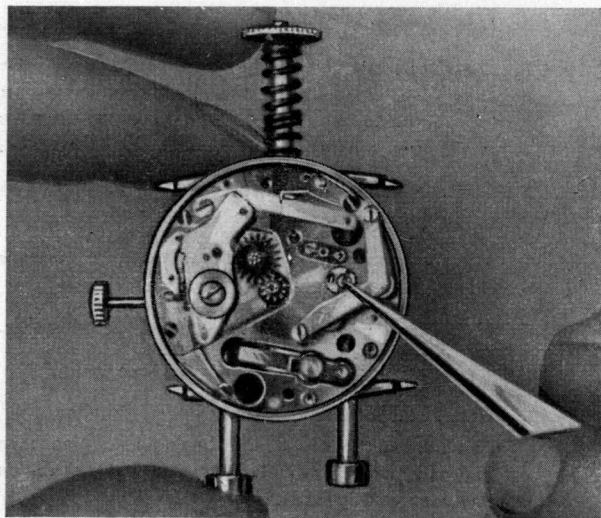


Fig. 7

Care should be taken to avoid shifting the two magnets on or removing them from the yoke, since correct polarity is important.

- (6.1.4) Release the upper yoke screws; remove the upper yoke by swinging it sideways. Care should be taken to avoid damaging the driving coil (see Fig. 8).
- (6.1.5) Release the screw at the stop magnet plate; lift off the magnet.

Attention: When the magnets have been removed, work can proceed as with spring wound watches.

- (6.1.6) Release the screw retaining the balance potence; lift off the balance potence with balance.
- (6.1.7) Release grub screw. Release curb-key and remove balance.
- (6.1.8) Release the shock protection at the balance potence.
- (6.1.9) Remove the screw retaining the brake spring; remove brake spring and central seconds drive.
- (6.1.10) Lift off the minute tube.
- (6.1.11) Release potence-retaining screws and lift off gear potence and small base wheel.
- (6.1.12) Release potence-retaining screws and lift off minute wheel potence.
Remove seconds wheel, ratchet wheel, and minute wheel. Particular care should be taken to avoid damaging the ratchet wheel.

- (6.1.13) Release lower shock protection in work base plate.
Attention: The adjusting lever for the contact spring should not be removed, otherwise the contact setting will alter. If for some reason the contact has nevertheless to be dismantled we recommend the following sequence of operations:

- (6.1.14) Release the contact-retaining screw (dial side) and swing the contact with the clamping piece and the tongue through the bore in the work base plate, avoiding any force. Watchmakers are advised to avoid releasing the screw at the clamping piece. If this routine is observed the skilled repairer will be able to adjust the contact within minor limits when assembling the work (see Figs. 9 and 10).
For further details see 6.4.13.

- (6.1.15) Dismantle the hands-setting device with the catch lever.

(6.2) Replacing faulty members

Before the work is reassembled, the members should be inspected for wear and faulty parts should be replaced if necessary. The balance will have to be replaced completely if balance pivot, switch pin or coil are damaged.

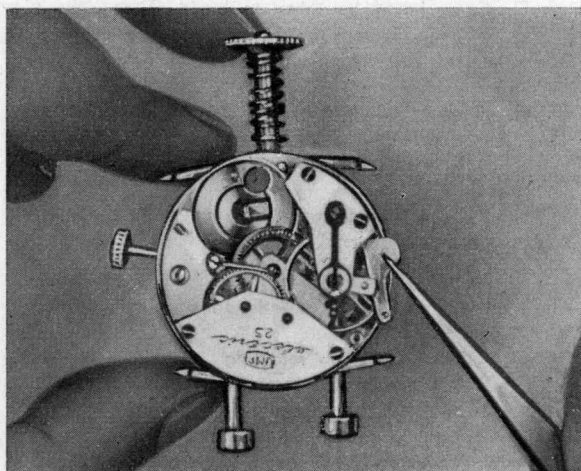


Fig. 8

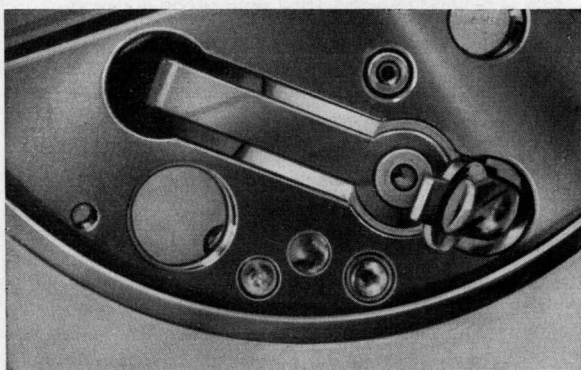


Fig. 9

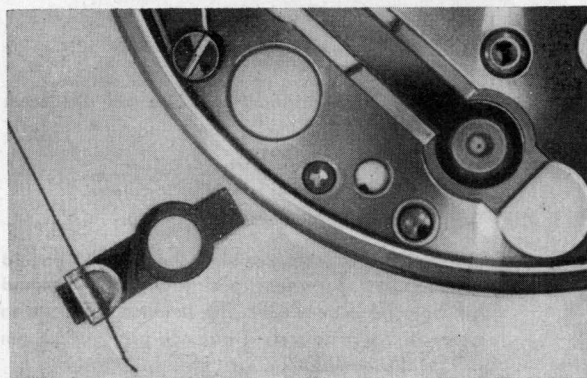


Fig. 10

(6.3) Cleaning

The working magnets and the stop magnet should not be cleaned in the cleaning apparatus because they would collect all magnetizable components possibly present in the cleaning agent. Particles collected by the magnets will have to be removed carefully with some adhesive paper or a thin piece of iron. All other members including balance and ratchet wheel, which must, however, be placed in a separate compartment of the cleaning basket, can be run through the usual baths at ordinary temperature.

We recommend the following cleaning agents:

- 1st bath: Wugaform
- 2nd bath: Light gasoline
- 3rd bath: Light gasoline

Cleaning the balance in isopropyl alcohol or any other alcoholic cleaning agents is strictly not permissible.

The balance should not remain for more than 2 to 3 minutes even in the recommended cleaning agents. All contacting surfaces, such as the contact pin at the balance, the outer edge of the contact wheel, and the contacting end of the contact spring, must be cleaned with elder-pith or a buff stick soaked in pure alcohol. Painsstaking cleanliness is indispensable. All members will have to be dried by warm air or centrifuging.

Saw dust is absolutely unsuitable.

(6.4) Reassembling, with concurrent checking

Attention: All moving members of the electric wrist watch RUHLA-ELECTRIC (Cal. 25) are balance-driven.

All contaminations, edge formation or excessive friction will bring the watch to a standstill.

Painsstaking care will therefore have to be applied when the watch is being assembled.

Absolute cleanliness is a prerequisite for good results.

- (6.4.1) Mount the catch lever and the hands setting device.
- (6.4.2) Check operation of rocker and catch lever. The catch lever must not be allowed to jam, and must be brought to its initial position by the catch lever spring when the hands gear is in the normal position.
- (6.4.3) Screw auxiliary member, tongue with cap jewel on according to 4.1.6.
- (6.4.4) Insert minute wheel, ratchet wheel, and seconds wheel; mount minute wheel potence.
- (6.4.5) Insert small base wheel; screw the gear bridge on.
- (6.4.6) Mount central seconds drive and brake spring.
- (6.4.7) Check easy movement of gear and clearance. Particular attention should be paid to clearance between seconds wheel and small base drive, as any contact will lead to a short circuit.
- (6.4.8) When the contact has been dismantled, if must be mounted in the reversed order. Care should be taken not to damage the contact spring.

(6.4.9) Screw off auxiliary member, tongue with cap jewel.

(6.4.10) Oil all bearings slightly. Ratchet wheel bearings, in particular, should not be oiled too thick.

(6.4.11) Screw on the tongue for the stop magnet.

(6.4.12) Check clearance between stop magnet and ratchet wheel. Space between them should be approximately 0.12 mm.

Neglect of this will result in a short circuit or prevent effective operation.

Check proper operation of the ratchet wheel.

(6.4.13) Contact adjustment.

Ways of adjusting the contact:

(a) In a longitudinal direction by releasing the clamping device (1). The contact has been set to the proper length by the manufacturers, so we do not recommend this operation.

Fig. 11 illustrates the contact position in relation to the ratchet wheel.

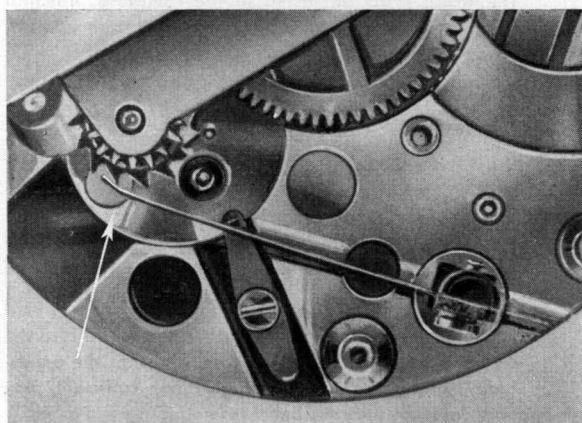


Fig. 11

Space between tooth face contact point must not permit any contact between them during the return motion.

(b) In transverse direction by moving the adjusting lever. This operation allows to change the contact time, with concurrent adjustment of the closing point. There must not be any contact between spring and wheel when any one of the 15 teeth is engaged (see Fig. 13).

(6.4.14) Oil and mount lower shock protection.

(6.4.15) Oil upper shock protection and mount it in the balance potence.

(6.4.16) Mount amplitude limiting finger, limiting plate, and spiral spring.

(6.4.17) Check the balance.

(6.4.17.1) Test coil for continuity with ohmmeter.

For the test the balance is to be placed in the reception, according to 4.1.4, with the spiral spring downward. The feeler tips connected with the measuring instrument, according to 4.1.3, are placed on the balance body and the switch pin.

The following indications can be read off the measuring instrument:

| Indication | Resistance indicated | Defect | Check and elimination |
|------------|----------------------|-------------------------|---|
| (1) | ∞ | Dis-continuous | Check soldered junction of wire and switch pin; reestablish junction, if necessary, with midjet soldering iron; use nothing but colophony for fluxing. If coil failure cannot be established, the balance must be replaced. |
| (2) | 0 | Coil is short-circuited | Check connection of un-engaged wire end from switch pin to coil. If the cause cannot be established, replace the balance. |
| (3) | 2.6 to 2.8 kilohm | Coil in working order | |

Care should be taken not to touch the coil with sharp tools, in order to avoid destruction.

(6.4.17.2) Check amplitude limiting finger. The limiting finger, which is placed between balance hoop and spiral spring, must be completely unobstructed. It must fall downward when the balance shaft is in either of its two vertical positions. Particular care should be taken to avoid obstruction of finger movability by dirt particles.

The fingers must not be oiled under any circumstances, and must remain absolutely free of grease.

(6.4.18) Check spiral spring for concentric and level running.

(6.4.19) Check the closing point.

The contact must have been closed when the coil, following the balance movement in switching direction, has covered the bores of the two working magnets by one quarter or up to one third (see Fig. 12).

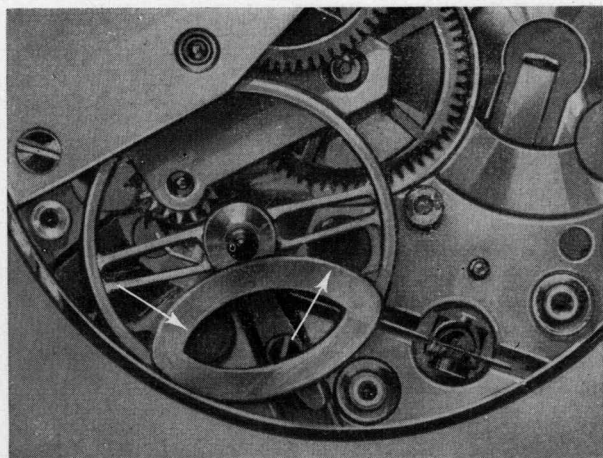


Fig. 12

Analogous to this operation the disconnecting point is located, in relation to the working magnet bores, symmetrically to the closing point (see Fig. 13). The ohmmeter can be employed for determining the closing or opening points, resp. For this operation the instrument is connected with the contact head to the watch work (see Fig. 8). The contact threshold consequent upon the balance movement, according to 6.4.19, can be recognized by the instrument pointer deflection. On disconnection the pointer goes back to ∞ . When the contact had been removed but not released from the clamping device, the contact holder within the clearance provided original contact setting can be found by moving in the insulating piece (see Fig. 13).

(6.4.20) Swing in and screw down the upper yoke. Keep in mind the information provided in 6.1.4.

(6.4.21) Insert and screw down the lower yoke with the magnets.

(6.4.22) Insert the test cell.

The balance motor must operate after an initial swing. If the watch does not start, the most likely cause will be found to be a mistake in applying the working magnets. The trouble can be eliminated by dismounting the lower yoke with the working magnets and exchanging them against each other.

(6.4.23) Remove the test cell, insert the operating cell. The voltage should be checked before the cell is inserted, it may amount to 1.6 V in very fresh cells, but ordinarily it should not fall below 1.5 V.

(6.4.24) Mount the minute tube.

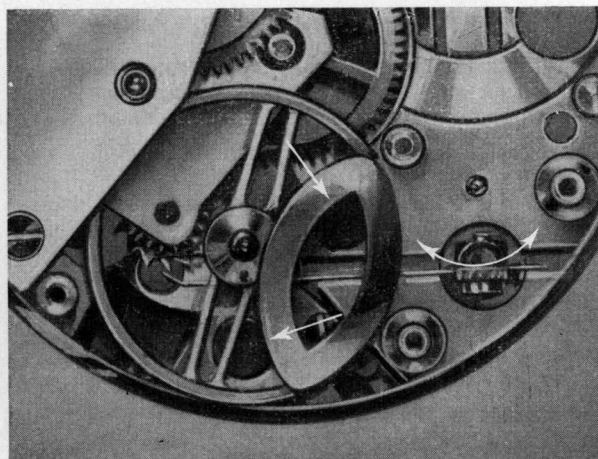


Fig. 13

(6.4.25) Mount the dial with hour wheel and hour hand; put on the minute and seconds hands.

(6.5) Final check

The watch is to be tested in the following principal positions: dial upward, dial downward; crown upward, crown downward, crown to the left.

Amplitude in horizontal position $\cong 240^\circ$.

Amplitude in vertical position $\cong 230^\circ$.

Current consumption of the balance motor will amount to 6–8 μA . The check must establish whether the amplitude remains constant or not. Larger amplitude variations, periodically repeated, indicate contact failure. A tooth of the contact wheel will be found to be damaged or dirty.

In the latter case the contact points should be cleaned again. Care should be taken to ensure that the amplitude limiting finger (stop finger) has sufficient play and does not jam the balance motor.

(6.6) Installation in the case

A conventional case is used for the electric wrist watch of caliber 25. Installation is effected in the normal sequence, so that no special instructions are required.

If the watch is to be installed in a case with a wide visual field, the watch must be fitted complete with mounted dial from the dial side. The hands setting shaft with the crown is fitted in the usual way by fastening the setting lever screw from the side of the potence. Care should be taken, when the glass is fitted with the glass-removing device, not to damage the dial. The glass should also be checked for its snug fit.

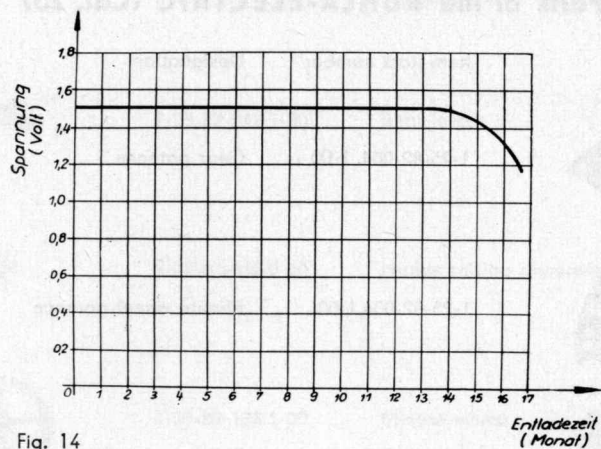


Fig. 14

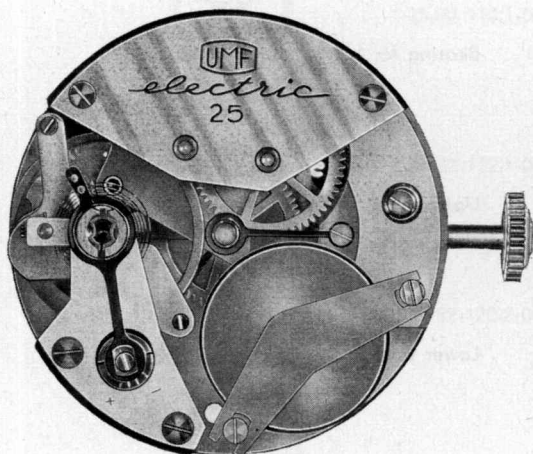


Fig. 15

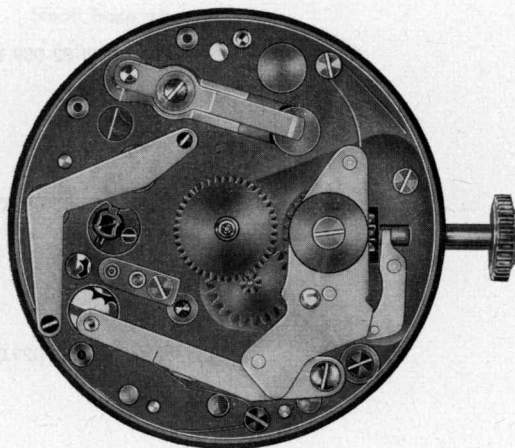


Fig. 16

View of the "RUHLA-ELECTRIC"

Fig. 15 View of the potence side


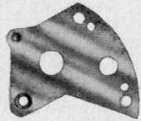









Fig. 16 View of the dial side




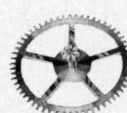


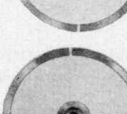
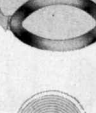



7. Concluding remarks

You will have been reading with interest this information concerning the first electric wrist watch produced in the German Democratic Republic, the RUHLA-ELECTRIC (Cal.25). It will have been obvious to you that technical progress does not stop at the well-known conventional wrist watch, and you will be keen on being informed of the latest technical developments in the field of small size watches.






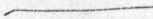




It has been, and will be, our intention to make you familiar with the operation and the uncomplicated design of the type of wrist watch represented by the RUHLA-ELECTRIC (Cal.25). We do hope that we have succeeded by presenting you with this information sheet.












8. Parts of the RUHLA-ELECTRIC (Cal. 25)

| Illustration | Item stock number | Designation |
|---|-------------------|---------------------------------|
|  | 1-25-82-004.1-00 | Gear potence |
|  | 1-25-82-006.1-00 | Minute wheel potence |
|  | 1-25-82-008.0-00 | Balance potence |
|  | 1-25-82-009.1-00 | Bearing for hands setting shaft |
|  | 1-25-82-028.0-00 | Upper yoke |
|  | 1-25-82-029.0-00 | Lower yoke |
|  | 1-25-82-030.1-00 | Rocker |
|  | 1-25-82-033.0-00 | Rocker centre wheel |
|  | 1-25-82-034.0-00 | Rocker hands setting wheel |
|  | 1-25-82-036.0-00 | Rocker bush |
|  | 1-25-82-037.0-00 | Rocker spring |

| Illustration | Item stock number | Designation |
|---|-------------------|--------------------------------------|
|  | 1-25-82-042.1-00 | Bent lever |
|  | 1-25-82-052.0-00 | Hands setting drive with square hole |
|  | 1-25-82-108.1-00 | Minute wheel |
|  | 1-25-82-110.1-00 | Small base wheel |
|  | 1-25-82-112.1-00 | Seconds wheel |
|  | 1-25-82-120.2-00 | Balance with spiral spring |
|  | 1-25-82-120.1-00 | Balance with shaft and double disc |
|  | 1-25-82-124.1-00 | Spiral spring with roller |
|  | 1-25-82-126.0-00 | Spiral spring block |
|  | 1-39-80-127.0-00 | Spiral spring pin |
|  | 1-25-82-134.0-00 | Central seconds drive |

| Illustration | Item stock number | Designation |
|--------------|-------------------|---|
| | 1-25-82-154.0-00 | Fine setting eccentric |
| | 1-25-82-155.1-00 | Curb |
| | 1-25-82-161.0-00 | Curb indicator |
| | 1-25-82-175.1-00 | Brake spring |
| | 1-25-82-205.0-00 | Minute tube |
| | 1-25-82-209.1-00 | Change wheel |
| | 1-25-82-215.0-00 | Hour wheel |
| | 1-25-82-217.0-00 | Expanding spring for hour wheel |
| | 1-15-51-300.0-00 | Embossed cap jewel for central seconds drive |
| | 1-25-82-300.0-00 | Embossed cap jewel for ratchet wheel |
| | 1-39-80-305.0-00 | Flat pierced jewel, cylindrical, for small base wheel and seconds wheel |

| Illustration | Item stock number | Designation | |
|---|---|--|------------------------|
|  | 1-25-82-310.0-00 | Flat pierced jewel, cylindrical, for ratchet wheel | |
|  | 1-25-82-323.0-00 | Embossed pierced jewel, olivary, for ratchet wheel | |
|  | 1-25-82-306.0-00 | Flat pierced jewel, cylindrical, for minute wheel | |
|  | 1-25-82-353.0-00 = 0.02 mm thick 387.0-00 = 0.05 mm thick 388.0-00 = 0.1 mm thick | } Disc for balance potence column | |
|  | 1-25-02-354.1-00 = 0.3 mm thick 389.0-00 = 0.1 mm thick | | } Disc for coke column |
|  | 1-25-82-356.0-00 | | |
|  | 1-25-82-384.0-00 | Upper shock protection block with clip | |
|  | 1-25-82-385.0-00 | Lower shock protection block with screw | |
|  | 1-25-82-405.0-00 | Insulating disc | |
|  | 1-25-82-408.0-00 | Insulating disc for element | |

| Illustration | Item stock number | Designation |
|---|--------------------|--------------------------|
|  | 1-25-82-415.0-00 | Insulating piece |
|  | 1-25-82-416.1-00 | Clamping chuck |
|  | 1-25-82-417.0-00 | Clamping piece |
|  | 1-25-82-418.0-00 | Current conductor spring |
|  | 1-25-82-421.1-00*) | Non-grooved magnet |
|  | 1-25-82-421.2-00*) | Grooved magnet |
|  | 1-25-82-424.1-00 | Tongue for stop magnet |
|  | 1-25-82-459.0-00 | Limiting disc |
|  | 1-25-82-460.0-00 | Stop finger |
|  | 1-25-82-464.0-00 | Catch lever spring |
|  | 1-25-82-465.0-00 | Retaining spring |

*) Observe the designation of the magnetic shoes

Illustration

Item stock number

Designation



1-25-82-466.1-00

Catch lever



1-25-82-468.2-00

Ratchet wheel



1-25-82-470.1-00

Adjusting lever



1-24-37-502.0-00

Screw for rocker



1-25-82-510.0-00

Screw for pontence and for rocker and catch lever springs



1-25-82-515.0-00

Screw for spiral spring block



1-25-82-522.0-00

Screw for bent lever



1-25-82-525.0-00

Screw for dial



1-25-82-537.0-00

Screw for brake spring










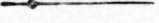



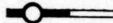
1-25-82-545.0-00

Screw for yoke



1-25-82-546.0-00

Screw for current conductor spring

| Illustration | Item stock number | Designation |
|---|-------------------|--------------------------------------|
|  | 1-25-82-547.0-00 | Screw for tongue and adjusting lever |
|  | 1-25-82-564.0-00 | Screw for retaining spring |
|  | 1-25-82-565.0-00 | Screw for clamping chuck |
| | 1-25-82-835.1-11 | Hands setting shaft, 13.2 mm long |
|  | 1-25-82-835.1-12 | Hands setting shaft, 11.8 mm long |
|  | 1-25-82-950.0-00 | Element 1.5 V |
|  | 1-25-82-601.0-00 | Minute hand, with luminous layer |
|  | 1-25-82-600.0-00 | Hour hand, with luminous layer |
|  | 1-25-82-674.0-00 | Second hand, 14.2 mm long |
|  | 1-25-82-603.0-00 | Minute hand, without luminous layer |
|  | 1-25-82-602.0-00 | Hour hand, without luminous layer |
|  | 1-25-82-615.0-00 | Minute hand, with luminous layer |
|  | 1-25-82-614.0-00 | Hour hand, with luminous layer |

9. The electromechanical wrist watch RUHLA-ELECTRIC with starting device (Cal. 25-12)

(9.1) Introduction

VEB Uhren- und Maschinenfabrik Ruhla have always been working hard to improve their products. Improvements do not only relate to watch efficiency but include increased operating comfort.

The development department of VEB UMF Ruhla have therefore designed a starting device for the RUHLA-ELECTRIC, the well-known electro-mechanical wrist watch, enabling even the technically inexperienced customer to set the watch to a specific time without applying the initial swing required up to now.

(9.2) Design and operation

The starting device has been arranged on the work plate, as illustrated in Fig. 17.

The rocker hands setting device operates a catch lever 1 in the conventional way. In contrast to the type 25-82, which is not equipped with the starting device, the catch lever has been provided with a nose 8. When the crown is pulled out, the rocker releases the catch lever. The catch lever spring moves the catch lever to the left up to the stop. A pivoted stop lever 2, mounted additionally on the work plate, is subjected to the pressure of spring 4 and is in non-positive connection with the catch lever. Nose 8 releases catch lever 2 when the catch lever moves in the direction stated above. A pin 6, which in its operating position is engaged by the cam of control disc 7, is riveted to the catch lever.

In its normal position, catch pin 6 is outside the circular movement executed by control disc 7. When the stop lever has been disengaged it turns under spring pressure in bearing 3 and moves catch pin 6 into the range of the control disc. The control disc, and with it

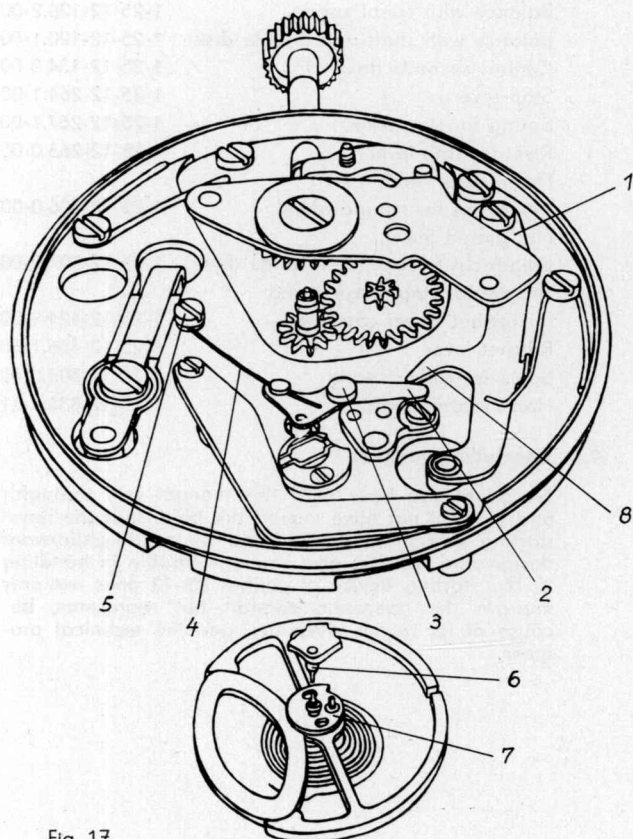


Fig. 17

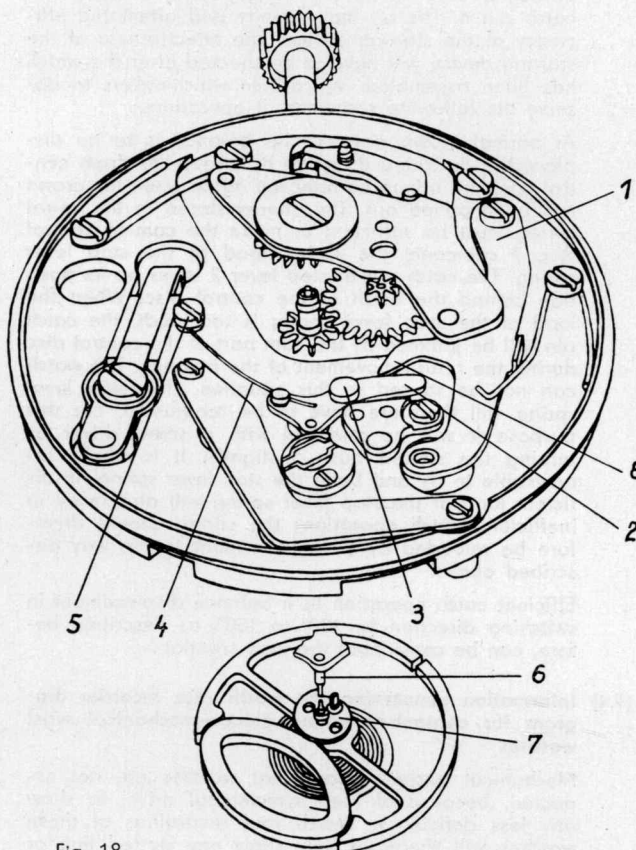


Fig. 18

the balance, are by this operation fixed in a predetermined position. The position of the arrested balance has been specifically defined, it will on the one hand open the current circuit and keep the spiral spring loaded by a certain amount on the other (see Fig. 18). When the crown is pressed, the rocker will in a non-positive connection move the catch lever 1, in the position indicated, to the right; nose 8 of the catch lever will move stop lever 2 and catch pin 6 out of the range of control disc 7. On being released the balance is supplied with an additional impulse by the appropriate design of the control disc. This impulse, together with the potential energy stored in the spiral spring, will set the balance moving and thus starts the watch (see Fig. 17).

The balance motor of caliber 25-12 receives one impulse per oscillation; the current circuit is therefore interrupted during the return movement. When the watch is brought to a standstill it may be possible for catch pin 6 to enter the range of control disc 7 during the return movement of the balance. In this case the balance must possess some spare energy to overcome the stop lever spring. Stop lever spring 4 is therefore adjustable by means of retaining element 5 and has been set so that the balance will still be caught securely after a displacement in switching direction of about 120° from zero position.

(9.3) Repairs

Repairs concerning the electromechanical wrist watch RUHLA-ELECTRIC of caliber 25-12 require the same tools and measuring instruments as those concerning the RUHLA-ELECTRIC not equipped with a starting device. Details can be found in the information sheet for the wrist watch of caliber 25. The work is disassembled and inspected in the same sequence of operations described there. The only matter to be kept in

mind is that stop lever 2 and stop lever spring 4 are not to be dismantled during the cleaning operation. When bearings are oiled, watchmakers should take particular care not to oil the stop lever bearing and catch pin 6. The oil may resinify and affect the efficiency of the starting device. The effectiveness of the starting device will have to be checked after the watch has been assembled. We advise watchmakers to observe the following sequence of operations:

At normal crown position the balance is to be displaced in switching direction by about 120° from central position, it is to be released again when the crown has been pulled out. The energy stored in the spiral spring must be sufficient to make the cam of control disc 7 overcome the spring load of the stop lever spring. The catch pin of stop lever 2 takes up its position behind the catch of the control disc. When the load of the stop lever spring is too much, the catch pin will be jammed by the cam part of the control disc during the return movement of the balance. The watch can not be started in this situation. The stop lever spring will therefore have to be readjusted. For this purpose it will be released with a screw driver by turning the slotted bush 5 slightly. It is wholly inadvisable to try and bend the stop lever spring. Insufficient load of the stop lever spring will also result in inefficient watch operation; the spring should therefore be reloaded by a slight amount in the way described above.

Efficient catch operation at a balance displacement in switching direction by 120° to 150° , as described before, can be considered the best criterion.

(9.4) Information concerning the watch rate recorder diagram for contact-controlled electro-mechanical wrist watches

Mechanical anchor escapement watches are not expected, because of their symmetrical drive, to show any loss deficiency. Watch rate recordings of these watches will therefore only show one dotted line or two dotted lines slightly spaced.

Operating conditions of contact-controlled electro-mechanical wrist watches differ. The oscillatory system of these watches has also been designed as the driving element. Balance oscillations are counted by means of a controlling gear and a dial train.

Thus the loss for this type of watch depend on the arrangement of the controlling gear and the type of contact.

There are electromechanical watches known whose contact arrangement permits the controlling gear a symmetrical drive in both oscillating directions (2 impulses per oscillation). These watches should not show any loss error, and the watch rate recorder diagram corresponds roughly to that of normal mechanical watches.

Electromechanical wrist watches, whose drive and controlling gear have been arranged unsymmetrically, deviate from mechanical watches with regard to loss. Driving and controlling direction coincide for the type of watch mentioned, and the balance will therefore have to do more work than at the return movement. The influence of the connecting link between balance and gear is a disturbance, as is the case with all balances with balance oscillator. This disturbance will in turn influence the isochronous operation of the oscillator. Changes in the connecting link can result in deliberate changes of the isochronous operation in electromechanical wrist watches. Since there exists a direct interdependence among all possible disturban-

ces, such as eddy current braking, plug-in point, closing point of the current-carrying coil, etc., compensation of these disturbances is possible. Several disturbances can very well be compensated, for example, by widening the recorded watch rate. The apparently increased loss indicated on watch rate recorder diagrams is therefore normal and does not constitute a deficiency.

Fig. 20 shows the watch recorder diagram of a well-known electromechanical wrist watch with non-symmetrical drive (1 impulse per oscillation); and Fig. 21 shows the watch rate recorder diagram of a RUHLA-ELECTRIC (also with 1 impulse per oscillation).



Fig. 20

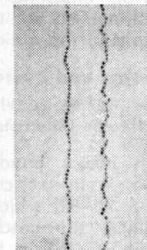


Fig. 21

(9.5) Additional parts

The following list of spares contains only the novel members required for the starting device. All other spares can be found in either the manual or the list of spares concerning caliber 25.

| Designation | Item stock number |
|---|-------------------|
| Minute wheel potence | 1-25-12-006.1-00 |
| Bearing for hands setting shaft | 1-25-12-009.1-00 |
| Rocker spring | 1-25-12-037.0-00 |
| Minute wheel | 1-25-12-108.1-00 |
| Small base wheel | 1-25-12-110.1-00 |
| Balance with spiral spring | 1-25-12-120.2-00 |
| Balance with shaft and double disk | 1-25-12-120.1-00 |
| Central seconds drive | 1-25-12-134.0-00 |
| Stop lever | 1-25-12-264.1-00 |
| Spring for stop lever | 1-25-12-267.1-00 |
| Rivet for stop lever | 1-25-12-263.0-00 |
| Flat pierced jewel, cylindrical for minute wheel | 1-25-12-306.0-00 |
| Flat pierced jewel, cylindrical for central seconds drive | 1-25-12-307.0-00 |
| Tongue for stop magnet and for ratchet wheel cap jewel | 1-25-12-424.0-00 |
| Ratchet lever | 1-25-12-466.1-00 |
| Screw for rocker spring | 1-25-12-503.0-00 |
| Hand setting shaft | 1-25-12-835.1-11 |

(9.6) Concluding remarks

No doubt you have read this manual very thoroughly and you will not have missed the point that the novel starting device is distinguished by a straightforward design and will not give you any trouble in handling it. The starting device of caliber 25-12 does not only improve the operating comfort but represents, because of its service affability, genuine technical progress.