AB TRANSVERTEX

TRANSVERTEX
HC-9

CIPHERING MACHINE

This file contains transcriptions of the following documents:

- Ciphering Machine HC-9 - Operation
  3 pages, 25 August 1967.

- Ciphering Machine HC-9 - Inspection Schedule
  3 pages, 25 August 1967.

- Spare Parts List for HC-9
  2 pages, 28 August 1967.

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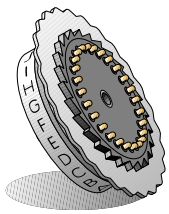

AB TRANSVERTEX

25.8.1967
VL/BK

CIPHERING MACHINE HC-9

OPERATION

1. LOADING AND LINING UP THE MACHINE.

1.1. Internal cipher setting

1.1.1 Insertion of alphabet sheet

Unlatch the sidedoor 288 by pulling the catch towards you and then open it. The drum 209 is withdrawn from the machine and the locking bolt 214 freed by pressing on the leaf spring 213. The alphabet sheet is then wound onto the drum, care being taken to ensure that its edge markings on alphabet No.8 counting from the top downwards are in line with the drum's white indexes. The alphabet sheet is then locked in place by pressing down on locking bolt 214 so that it locks in under the leaf spring 213. The drum is then slid onto its axle sleeve in the apparatus and rotated until pin 207 meets the corresponding hole in the drum end face. When this is done the drum can be fully inserted to its working position. Provided that the apparatus has no punched card inserted a check can now be made that the alphabet sheet is correctly inserted by making one working stroke with the trigger; when this is done alphabet No.l (marked with a star) should appear at the reading window. Minor deviations from the correct position (central in window) are adjusted by means of the knob on the front of the apparatus.

1.1.2 "Setting of pins"

The hinged retaining plate 284 at the back of the apparatus is opened by moving the locking slide 267 to the right. The punched card in use is then inserted by threading onto the three pins on the punched card holder 254 and the retaining plate is then reclosed upon it.

Internal cipher setting is now complete.

1.2 External cipher setting (setting the reading wheels)

The release lever 284 at the rear of the apparatus is moved forward, i.e. away from the operator, thereby freeing the driving shaft 136 which can now be turned by means of the knob on the right of the machine until the counter shows 0000. Release lever 279 is then reset and again locks the driving shaft 136. When this has been done the reading wheels are set to the desired letter combination by turning the knurled discs that project through the top cover.
The machine is now ready for ciphering or deciphering, which is effected as follows :

2. CIPHERING AND DECIPHERING PROCEDURE

A feed stroke is made with the trigger 156 whereby the trigger knob is turned with the left hand anticlockwise as far as it will go (about 100^{o}) and then released. The first letter required to be ciphered or deciphered is looked for in the ordered alphabet 281 and the corresponding letter from the alphabet showing in the reading window read off and noted. A new feed stroke is then made and the procedure repeated with the second letter, and so on.

3. MACHINE OPERATION

3.1 When the trigger is turned clockwise as viewed from the left hand side the following occurs in the machine.

The finger 160 actuates the gearwheel 159 which in turn causes the drum bearing 204 and hence the drum 209 to turn anticlockwise as viewed from the left. The drum bearing 204 additionally actuates the finger 185 and thereby brings the four segments 190, 194, 198, 200 and the adjusting cam 202 to zero angular setting which is attained when trigger 156 is turned to the full extent. At the same time the tongue on finger 160 has during the initial stage of turning actuated the resetting catch 116 of the resetting slide 114 so that the five setting arms 103 are turned via the intermediary of the resetting arm 111 and resetter 109 until they reach their zero initial positions where they are held by the bent tails on the catches 105. By this action the four segments 190, 194, 198, 200 and the adjusting cam 202 which are controlled by the studs 106 on the setting arms 103 are also zeroed in the axial direction. At the same time as this zeroing takes place the driving shaft 134 is advanced one step (i.e. by one tooth division) by the feed cam 164 (secured to the main shaft) acting through feed arm 165 and feeder 167; as a result of this action the five reading wheels and the counter are advanced one step.

Meanwhile the five aligners 117 have started to move forward under the action of springs 126 on spindle 134 and when the feed advance of the reading wheels is completed they have advanced so far that their aligning catches 119 begin to actuate the feed discs 329, causing them to turn clockwise as viewed from the left. Pin 223 in the reading wheels now starts to be extruded radially and that part of it which is in front of pin 260 in the card holder 254 pushes out the latter pin.

If the punched card has a hole in front of this pin the pin can continue its forward movement, as a result of which aligner 117 is free to continue under the action of its spring and trip the tail on catch 105 whereby the setting arm 103 turns under the action 0f spring 125 clockwise, as viewed from above the machine, sufficiently to cause the tail of catch 105 to fall into the second notch in the chassis. This causes the segment concerned to be shifted axially to the left under the action of the corresponding stud 106.

Should the punched card have no hole in front of the pin 260 in question the pin and corresponding aligner 117 will be obstructed and hence prevented from actuating the tail of catch 105; the latter will therefore stay in its zero position whilst the corresponding segment likewise remains in its axial zero position.
The segment and adjusting cam have now taken up their positions respectively, opposite a hole and opposite a blank. A pawl 163 engages with the toothed rim of the feed cam 164 to prevent inadvertent advance of the counter and hence of the driving shaft 136 without the trigger, having completed its full operating stroke.

3.2 Return movement of trigger

As a consequence of the trigger's return movement the finger 185, the drum 209 and the gearwheel 159 are caused by the spring 271 secured to the gearwheel to turn by the number of steps indicated by the relative axial positions of the four segments and the adjusting cam whereby the corresponding alphabet is shown in the reading window.
Finger 160, spindle 134 and hence aligners 117 and feed arm 165 also return to their original positions.

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CIPHERING MACHINE HC-9

INSPECTION SCHEDULE

1. Remove top and bottom covers. Check that number stamped on chassis agrees with number plate on bottom cover.

2. Turn machine upside down and check tightness of the 3 hinged retaining plate screws, the 2 drum holder assembly screws and the lock screw of the segment axle.

3. Place machine with the counter end upwards and check tightness of the 10 screws on the counter end of the chassis.

4. Place machine upright and check tightness of counter retaining screw, feed stop, and the two feed wheel screws.

5. Rotate machine a half turn sideways and check tightness of the 6 screws on the left hand side of the chassis and the 4 screws on the drum holder assembly.

6. Place machine in its normal working position. Make a half trigger stroke and check that at least 50Z of the width of each aligner catch engages the teeth of its feed disc.

7. Complete the stroke and check that each finger mates freely into its segment slot.

8. Turn machine upside down. Make a couple of operating strokes and check that the setting arm catches are lifted 0.5 - 1 mm on resetting.

9. Place machine upright again. Set the counter to 0000 and set combinations B C C D D, make a half stroke of the trigger and check that the leading edge of each reading wheel pin touches the card holder pin facing it. Reset counter to 0000, set combination A A A A A, turn driving shaft to 9 9 9 0 and make feed strokes to 9 9 9 3 checking how the reading wheel pins meet the card holder pins.

10. Reset counter to 0000, set various cipher keys on the reading wheels and check that these neither jam nor turn too easily in any position.

11. Check that the driving shaft feed does not bear hard on the feed stop. When feed is complete the driving shaft should have a certain amount of play.

12. Check that the pawl moves easily in both directions and easily resumes its zero position. Check that the counter cannot be fed forward without the stroke being completed and that the trigger does not reverse its movement until all segments are zeroed.

13. Check that after the operating stroke the trigger even at slow motion returns to its original position.

14. Check feed wheel catches. The driving shaft must not be able to "jump past" in any position.

15. Check that when an operating stroke is completed there is a certain amount of play in the segment complex, i.e. that the adjusting cam.spring is loaded but that the spring carrier does not bear hard down (0.3 - 0.5 mm play) when the adjusting block knob is screwed right in.

16. Check that the gearwheel transmission to the drum axle and segment axle does not stick in any position.

17. Check that the counter does not jump after completed feed, i.e. that the position catch for the feeder wheel coincides with the feed.

18. Release driving shaft and check that it turns easily in either direction.

19. Replace top and bottom covers. Insert check punched card and master drum. Set. counter to 0000 and reading wheels to A A A A A. Make 35 slow operating strokes, return to 0000 and make 35 fast operating strokes. Read drum continuously. No errors are admissible. At the same time check that the reading wheels (or the driving, shaft's knurled setting discs) do not jerk forward since this is a sign of sticking somewhere.

20. Check:

    a/ That the hinged retaining plate catch moves easily and freely in its slot and that the plate itself opens and closes readily.

    b/ That the release lever works easily and fully frees the driving shaft.

    c/ That the side-door opens and closes easily and has a good fit.

    d/ That the counter is properly placed in its aperture.

    e/ That the setting discs are slightly over to the right hand side of their slots and on no occasion foul the left hand side of their slots when changing the reading wheel settings.

    f/ That the drum is easy to remove and insert and that it will rotate without hindrance even when the top cover is pressed down.

21. Check that the letters on the reading wheels form a straight row with the index marks. The index fingers must not touch the reading wheels.

22. Check that each row of letters on the drum stops at exactly the same position in the reading window.

23. Check that three quarter turn on the setscrew in either direction moves the drum symmetrically about its zero position.

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SPARE PARTS LIST FOR HC-9

1st figure represents size of drawing
2nd -"- -"- machine type

Item No.	Name	Number per machine
HC-49101	Chassis assembly	1
49117	Aligner	1
49125	Setting spring	1
49126	Aligner spring	1
49127	Aligner catch spring	1
49129	Main shaft assembly	1
49136	Driving shaft assembly	1
49154	Bearing plate	1
49156	Trigger assembly	1
49161	Bearing plate	1
49164	Feed cam	1
49165	Feeder arm	1
49170	Catch	1
49172	Feed stop	1
49173	Feeder spring	2
49174	Catch spring	2
49175	Reset spring	5
49176	Bottom cover assembly	1
49178	Drum holder assembly	1
49179	Drum holder end plate	1
49180	Drum axle	1
49181	Segment axle	1
49185	Dog	1
49190	Segment 1	1
49194	Segment 2	1
49198	Segment 3	1
49200	Segment 4	1
49202	Adjusting cam	1
49204	Drum axle sleeve	1
49208	Lock spring	1
49209	Drum	1
HC-49215	Reading wheel axle	1
49216	Reading wheel 1	1
49231	Reading wheel 2	1
49236	Reading wheel 3	1
49241	Reading wheel 4	1
49246	Reading wheel 5	1
49251	Shaft lock	1
49252	Counter bracket	1
49253	Counter retaining plate	1
49254	Punched card holder assembly	1
49263	Glass for setting	1
49264	Window frame	1
49268	Gearwheel	1
49269	Stroke counter	1
49271	Drive spring	1
49273	Glass for code drum	1
49275	Spring roller	1
49276	Writing surface	1
49277	Writing surface holder	1
49278	Release lever	1
49280	Reset spring	1
49281	Mask	1
49284	Hinged retaining plate assembly	1
49288	Side door	1
49293	Spacing collar	1
49294	Rubber foot	4
49299	Shaft	1
49304	Drive spring	1
49307	Nylon block	1

Item No.	Name	Number per machine
HC-49309	Adjusting spring	1
49314	Pawl spring	3
49316	Top cover, partly assembled	1
49323	Adjusting block assembly	1
49325	Screw	11
49326	Symbol plate	1
49328	Catch spring	1
49338	Drum guard	1
49341	Angle bracket	1
49342	Guide plate	1
49343	Washer	1