

M/ 700 VERTICAE DROP TESTING



CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

R2537226



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R2537229



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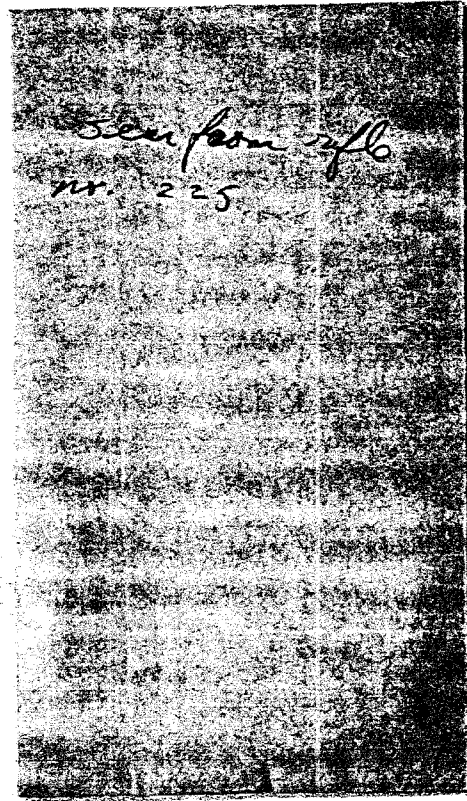
R2537230



CONFIDENTIAL-SUBJECT TO PROTECTIVE ORDER
KINZER V. REMINGTON

R2537231

M700 SEAR POWDER METAL



Connector, Sear, & Safety Cam
Used in 721, 722, 700, 600

4-44-73

A 15436 Connector M 600, 660
A 19461 Connector M 721, 722, 700
B 19461 Connector M 721, 722, 700 Current print

1B 17945 Safety Cam (Blank) 721, 722, 700
2B 17945 Safety Cam 721, 722, 40X
B 15369 Safety Cam M 600, 700, 40XB

1B 17946 Sear (Blank) M 721, 722, 725, 700
2B 17946 Sear M 721, 722, 725, 700

1C 17946 Sear (Blank) M 721, 722, 725 - Before 61
2C 17946 Sear M 721, 722, 725

N 26590 ^{Introduced in 1961} Sear Safety Cam Assembly (2pc.) M 600, 700

N 22045 Sear Safety Cam Assembly (2pc.) M 721, 722

C 15666 ^{Introduced in 1966} Sear Safety Cam Assembly M 600, 700

CC: R.A. Williamson
H.J. Hackman
L.J. Boyle
W.C. Schrader
~~M.H. Walker~~ *Brooks*
A.J. Seckner) In
D.E. Geiss) turn
V.G. DeReus
Estimate File #2502

April 13, 1966

A.D. KERR

MODEL 600-700 SEAR AND SAFETY CAM ASSEMBLY
USING INVENTORIES OF OLD DESIGN PARTS VERSUS
THEIR DISPOSAL AND SUBSTITUTING WITH THE
NEW ONE-PIECE POWDER METAL ASSEMBLY

It is our understanding that approximately 40,000 Sears and Safety Cams are on the plant in the "as received" condition.

In view of the apparent attractive cost for the new one-piece powder metal design, a review has been made to determine an economic disposition of the parts on hand.

Discounting the purchase price, the estimated direct cost to complete these parts into Sear and Safety Cam Assemblies is \$11,500. The estimated cost to produce (per our present process) 40,000 of the one-piece powder metal assemblies is \$4,300. This indicates a gross savings of \$7,200 in plant operating costs with the powder metal component.

When sufficient quantities of new parts are available to meet production requirements, it would seem economically advisable to dispose of any old part inventories in the "as received" condition.

F. G. Carlson, Supervisor
Methods & Standards Section

R. F. Kerr
R. F. Kerr

RFK:am

cc: R.A. Williamson
S.M. Alvis
H.J. Hackman
V.G. DeReus
A.J. Seckner) In
D.E. Geiss)
Estimate File #2502

April 4, 1966

M. H. WALKER

MODELS 700, 600, 100, 40XB - SEAR AND SAFETY CAM ASSEMBLY
COST COMPARISON - OLD TWO-PIECE DESIGN VERSUS
NEW POWDER METAL SINGLE-PIECE CONSTRUCTION

In response to your recent request, estimates have been developed to show a comparison of full factory costs. Costs for the proposed single-piece powder metal design are based on the common process just released by PE&C.

<u>Sear and Safety</u> <u>Cam Assembly</u>	<u>Present</u> <u>Part No.</u>	<u>Estimated</u> <u>Cost per 100</u>		<u>Estimated</u> <u>Reduction</u> <u>per 100</u>
		<u>Present</u>	<u>Proposed</u>	
Model 700, 600	26591	\$ 53.91	\$ 14.72	\$ 39.19
Model XP-100	26735	54.10	14.72	39.38
Model 40XB	26591	63.97	14.72	49.25

Our 1966-#2 Sales Forecast totaling 87,125 units, shows a full factory cost reduction of approximately \$34,300 with the new process.

F. G. Carlson, Supervisor
Methods & Standards Section


R. F. Kerr

PEK:sm

cc: W.L. Leek
C.R. Morse
R.H. Walker
J.W. Brooker
Hest. Vetterman
R.P. Kelly

Ilion, New York
June 23, 1966

MEMORANDUM

TO: C. D. Vetterman *CDV*
FROM: A. A. Hagick

DROP TESTING OF MODEL 600 POWDER METAL SEARS

The enclosed drop test procedure was organized and conducted using the M/600 with one piece powder metal sears. Drop testing at ten inches corresponds to the test manual standard and waist high drop testing (45") was included for increasing drop test severity. A sample of chrome plate powder metal sears produced to date was included for drop test purposes. Sears numbered 1 thru 5 are old style sears with the large .003+ inch radius at the connector surface edge. Sear numbered 6 thru 8 are new sears with .001+ inch radius at the connector surface edge.

Fire control adjustments were made by production prior to drop testing.

Listed below are M/600 powder metal sear drop test observations:

1. The measured RC hardness of the new PM samples was 45 RC average versus 50 RC average for old samples.
2. No malfunctions were experienced at the normal drop height of 10".
3. Page 2 contains listed jar-off malfunctions encountered during the waist high M/600 drop testing. These high drop malfunctions are similar to prior test results of May 1964 special "Jar-Off" testing.
4. Tight sear pin holes of the new sears were polished out prior to drop testing.
5. Minor chipping of the sear connector edge of the old sear was noticed when examined with a 20X glass.

REMINGTON ARMS COMPANY, INC.

ENGINEERING DEPARTMENT **COMPUTATION SHEET**

SHEET NO. 1

TITLE OF PROJ. **M 600 POWDER METAL SEAR**
 SUBJECT **CHROME PLATED POWDER METAL SEAR**
 DATA FOR **DROP TESTING** COMPUTER **AAH**

PROJ. NO.

WORKS

DATE **6-9-66** 19

SEAR NUMBER	TOTAL NUMBER OF DRY CYCLES	SEAR RADIUS AT CONN. EDGE	SEAR COMPONENT WEIGHT & HARDNESS	AVE. TRIB. PULL AT BEGINNING AND END OF TEST
1	0	.0034	9.3900 gr. 48 RC SCALE	5.77 - 5.60
2	0	.0039	9.3705 gr. 51 RC SCALE	6.25 - 5.30
3	0	.0042	9.3655 gr. 53 RC SCALE	5.45 - 5.70
4	0	.0039	9.4176 gr. 51.5 RC SCALE	5.00 - 4.85
5	0	.004		

TITLE OF PROJECT

M 600

POWDER METAL SEAR

PROJECT NO.

SUBJECT

DROP TEST

RESULT WITH M600

WORKS

PM SEAR TESTING

COMPUTED BY

AAH.

DATE 6-14-66

19

TYPE

CHRONOLOGICAL RECORD OF TESTING

MODEL & DESCRIPTION m/600

New P.M. sears.

CALIBER or GAUGE 308

~~the same as~~ (LATEST - SHARP)

DATE 6-3-66

TEST P.M. Sear Drop Test

(re-test)
TESTER

PAGE NO.

J. Hennings.

barrels - " m/7 20344 were used placing different sears
in these two barrels only. (3 sears)

✓ Test - I - Trigger pulls & firing pin indents (on sep. sheets.)

✓ Test - II - No malfunctions noticed

✓ Test - III - (butt down) sear # 2 had a total of 3 drops in
which the safety was jarred to the "ON" pos.

CHRONOLOGICAL RECORD OF TESTING

MODEL & DESCRIPTION *m/600 New P.M. sears.*

CALIBER OF GAUGE *308* (*LARGE RAP. SEAR*)

DATE *6-2-66* TEST *P.M. Sear Drop Test*

TESTER
J. Hennings.

PAGE NO.

✓ Barrels # *1167 & 20341* were used placing different sears in these two barrels only.

✓ Test - I- Trigger pulls + firing pin indents (on sep. sheets

✓ Test - II- No malfunctions noticed.

✓ Test III- (~~butt~~ ^{muzzle} down) - sears # *1+2* had a total of *5* drops in which safety jarred to "ON" position.

✓ Test - IV- No malfunctions noticed.

✓ Test - V- (butt down) - sears # *1,2,3,4,5* had a total of *13* drops in which safety jarred to "OFF" position.

CHRONOLOGICAL RECORD OF TESTING

MODEL & DESCRIPTION	TEST	TESTER	PAGE NO.
m/600	std. rear drop test.		
CALIBER OF GAUGE	308	PRESENT PRODUCTION (2 piece)	

6-13-66 661.8 # 11674 20344 308 cal. m/600
were dropped from various pos. with
std. rears in fire-control.

#1167 all tests OK except Test V. muzzle-down
waist high the safe jammed to "off" pos. on all 3 de.

" 20344 Tests I-IV-OK

Test II - (butt down
waist high) → safe jammed to "off" pos. on all 3 de.

Test VI → (muzzle-down
waist high) on 1st drop gun fired

Test VI → (bottom-side down
waist high) - on 3rd drop gun fired

Test - VI → (butt down
waist high) → safe jammed to "on" pos. on 3rd drop

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE



"CONFINE YOUR LETTER TO ONE SUBJECT ONLY" _____

DROP TEST PROCEDURE

MEASUREMENT and TEST LAB

- I. Trigger Pull and Firing Pin Indent
 - A. Take five samples.

- II. Safety Mechanism Shock Test
 - A. Drop gun ten inches on solid wood surface with safety "ON".
 1. Butt down
 2. Muzzle down
 3. Topside down
 4. Bottom down
 - B. The Trigger shall be tried after each drop to determine whether the safety has released any mechanism which may allow firing.
 - C. Three drops per position.

- III. Jar-Off Test
 - A. Drop gun ten inches on solid wood surface with safety "OFF".
 1. Butt down
 2. Muzzle down
 3. Topside down
 4. Bottomside down
 - B. The Trigger shall be tried after each drop to determine whether the safety has released any mechanism which may allow firing.
 - C. Three drops per position.

AAH:T
566

DROP TEST PROCEDURE - Measurement & Test Lab

IV. Safety Operations Test

- A. This test is for testing the safety mechanism.
 - 1. Cock gun
 - 2. Put Safety "ON"
 - 3. Try Trigger
 - 4. Release the Safety
 - 5. Pull Trigger
 - 6. Record if Trigger functions with Safety on
 - 7. Record if Firing Pin fell when Trigger was pulled
- B. Make 50 trials.

V. Safety Mechanism Shock Test

- A. Drop gun "waist height" on solid wood surface with safety "ON".
 - 1. Butt down
 - 2. Muzzle down
 - 3. Topside down
 - 4. Bottomside down
- B. The Trigger shall be tried after each drop to determine whether the Safety has released any mechanism which may allow firing.
- C. Three drops per position.

VI. Jar Off Test

- A. Drop gun "waist height" on solid wood surface with safety "OFF".
 - 1. Butt down
 - 2. Muzzle down
 - 3. Topside down
 - 4. Bottomside down
- B. Trigger shall be tried after each drop to determine whether the safety has released any mechanism which may allow firing.
- C. Three drops per position.

VII. Gun Function Check

- A. Trigger pull
- B. Firing pin indent
- C. Take sample of five.

Illion, New York
June 13, 1966

MEMORANDUM

To: C. B. Workman

From: A. A. Hugick

DROP TESTING OF MODEL 700 POWDER METAL SEARS

The enclosed drop test procedure was organized and conducted using M/700 powder metal sears. Two samples of M/700 sears were submitted for drop testing at this time.

Sample No. 1 consisted of M/700 chrome plated powder metal sears with approximately .003" radius when received from Production and had been cock-and-fire dry cycled for 30,000 cycles each. No malfunctions of the sear were encountered during drop testing of sample No. 1 sears.

Sample No. 2 consisted of M/700 chrome plated powder metal sear with approximately .0005-.001" radius at the connector edge, increased density, and zero dry cycles. No malfunctions of the sear were experienced during drop test of the M/700. This sample of sears had tight pin holes and had to be polished out for testing.

The fire control adjustment was made by Production prior to the dry cycle and drop testing. Hardness measurements on the RC scale varied from 38.5 RC to 54.5 RC. This variation of measured RC hardness should be clarified. *Reedy Chalkwick said that Hardness spec was changed.*

Recommendations:

REMINGTON ARMS COMPANY, INC.

ENGINEERING DEPARTMENT

COMPUTATION SHEET

SAFETY NO.

M 700 PM SEAR TEST
DROP TEST SEAR DATA.

PROJECT

WORKS

COMPUTER A A H

DATE

19

SAMPLE NUMBER ONE				
SEAR NUMBER	TOTAL NUMBER OF DRY CYCLES	SEAR RADIUS AT CONNECTOR EDGE	SEAR COMPONENT WEIGHT & HARDNESS	AVE. TRIG. PULL ① BEGINNING AND END OF TEST
153959	30,000	.0045	9.3685 GRAMS 38.5 RC SCALE	5.10 - 5.10
139298	30,000	.0035	9.4080 gr 52 RC SCALE	5.20 - 5.15
139413	30,			

CHRONOLOGICAL RECORD OF TESTING

MODEL & DESCRIPTION ~~700~~ ^{POWDER METAL SEAR WITH 10035} ~~10035~~

CALIBER or GAUGE .243

DATE 6-1-66 TEST M/700 sear drop test TESTER J. Hennings. PAGE NO.

Cartridges - 1 139298, 2 139459, 3 139555, 4 139454, 5 139413 - were used
with powder metal
manufactured sears.

Test - I - Trigger pulls & Firing pin indents - (separate sheets)

Test - II - (top side down) # 139454 on second drop rear sight broke

Test - III - (bottom side down) # 139451 on first & second drops bolt jarred open

Test - IV - no malfunctions noticed

Test - V - (top side down) # 139457 on second drop rear sight came off
(bottom side down) # 139298 on second drop stock started to crack
around trigger plate.

Test - VI - (muzzles down) sears # 1,

CHRONOLOGICAL RECORD OF TESTING

MODEL & DESCRIPTION 700 P.M. sear (LATEST P200 w SHARP RND)

CALIBER or GAUGE .243

DATE 6-1-66 TEST P.M. sear Drop test TESTER J. Hennings PAGE NO.

barrels # 139298 & 139413 were used with new P.M. sears.

TEST - I - Trigger pulls & firing pin indents (separate shoots)

TEST - II - (butt down) - # 139298 - on first drop rear sight broke off.

TEST III - (MUZZLE down) - # 139298 - on second drop bolt jarred open.

TEST - IV - no malfunctions noticed.

TEST - V - no malfunctions noticed.

TEST - VI - (butt down) both guns - a total of 4 drops in which safety was jarred open.
139298 on third drop bolt jarred open.

NOTE! ON BOTH ACTIONS PIN HOLE LOOS TIGHT
CAUSING SEAR TO BIND--

DROP TEST PROCEDURE - Measurement & Test Lab

IV. Safety Operations Test

A. This test is for testing the safety mechanism.

1. Cock gun
2. Put Safety "ON"
3. Try Trigger
4. Release the Safety
5. Pull Trigger
6. Record if Trigger functions with Safety on
7. Record if Firing Pin fell when Trigger was pulled

B. Make 50 trials.

V. Safety Mechanism Shock Test

A. Drop gun "waist height" on solid wood surface with safety "ON" *safe*.

1. Butt down
2. Muzzle down
3. Topside down
4. Bottomside down

B. The Trigger shall be tried after each drop to determine whether the Safety has released any mechanism which may allow firing.

C. Three drops per position.

VI. Jar Off Test

A. Drop gun "waist height" on solid wood surface with safety "OFF" *safe*.

1. Butt down
2. Muzzle down
3. Topside down
4. Bottomside down

B. Trigger shall be tried after each

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington
DUPONT*PETERS*
DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY" _____

DROP TEST PROCEDURE

MEASUREMENT and TEST LAB

- I. Trigger Pull and Firing Pin Indent
- A. Take five samples.
- II. Safety Mechanism Shock Test
- A. Drop gun ten inches on solid wood surface with safety "ON" *Safe*.
1. Butt down
 2. Muzzle down
 3. Topside down
 4. Bottom down
- B. The Trigger shall be tried after each drop to determine whether the safety has released any mechanism which may allow firing.
- C. Three drops per position.
- III. Jar-Off Test
- A. Drop gun ten inches on solid wood surface with safety "OFF" *Safe*.
1. Butt down
 2. Muzzle down
 3. Topside down
 4. Bottomside down
- B. The Trigger shall be tried after each drop to determine whether the safety has released any mechanism which may allow firing.
- C. Three drops per position.

AAH:T
566

Date Received 5-31-66

Model 700

Description

Barrel ~~Len.~~

139298

Caliber

.243

Type of Feed

6014

Other

~~Lead~~ ~~5mm~~ "1"
Powder metal .0032x

Date 5-1-66

Firing Pin Indent (Inches)

Before

1 .020
2 .020
3 .020
4 .020
5 .020

Avg. of 5 .020
Max. .020
Min. .020
Ev. 0

Firing Pin Indent

After

661.

139 298

Test - I - OK

" II - OK

" III - OK

" IV - OK

" V - A.

4. on second drop stock started to crack around trigger plate.

" VI. A.

2. on first + second drops safety jammed to "ON" position.

3. on second drop bolt opened.
on third drop safety jammed to "ON" position.

4. on second & third drops bolt jams open

Date Received 5-31-66

Model 700

Description

Barrel Len. # 153959
Caliber .243.
Type of Feed bolt
Other ~~wood~~ ~~metal~~ # 2
Powder metal wcp2.

Date 6-1-66

Firing Pin Indent (Inches)
Before

1 .020
2 .0195
3 .0195
4 .020
5 .020

Avg. of 5 .0195
Max. .020
Min. .0195
Ev. .0005

Firing Pin Indent
After

1 .0215
2 .0215
3 .022
4 .022
5 .0215

Avg. of 5 .0217
Max. .022
Min. .0215
Ev. .0005

Trigger Pull (lbs.)
Before

1 4.75
2 5.25
3 4.75
4 5.25
5 5.50

Avg. of 5 5.10

661

153.95-9

Test- I - OK

Test II - OK

" III - OK

" IV - OK

" V - OK

" VI - A.

B on all three drops safety was
jammed to "ON" position.

4. on third drop bolt opened

Date Received 5-31-66

Model 700

Description

Barrel Len.

139550

Caliber

.243

Type of Feed

bolt

Other

prod. ~~3~~ 3
Powder MTCAL .00682

Date 6-1-66

Trigger Pin Indent (Inches)
Before

1 .021
2 .021
3 .020
4 .020
5 .020

Avg. of 5 .0204
Max. .021
Min. .020
Ev. .001

Firing Pin Indent
After

1 .021
2 .022
3 .0215
4 .022
5 .0215

661 # 139555

Test I- OK

" II - OK

" III - OK

" IV OK

" V OK

" VI A.

1. - on second and third drops safety was
jammed to "ON" position.

3 - on first + third drops bolt opened on
recoil of drop.

4. stock broke at rear of trigger guard
on first drop.
on second drop bolt opened on
recoil of drop.

Date Received 5-31-66

Model 700

Description

Barrel Len.
Caliber
Type of Feed
Other

139457
.243
bolt
~~ad.~~ #4
powder ~~max~~ 50053 R.

Date 6-1-66

Trigger Pin Indent (Inches)
Before

1 .030
2 .020
3 .020
4 .020
5 .0195

Avg of 5 .0199
Max. .030
Min. .0195
Ev. .0005

Firing Pin Indent
After

1 .019
2 .019
3 .019
4 .020
5 .019

Avg of 5 .0192
Max. .020
Min. .019
Ev. .001

Trigger Pull (lbs.)
Before

4

661. # 139 457

Test - I - OK

" II - A.

3. on second drop rear sight broke

" III - A.

4. - on first + second drop bolt jammed open.

" IV - OK

" V - A.

3. on second drop rear sight came off.

" VI A.

3 on third drop bolt jammed open

Date Received 5-31-66

Model 700

Description

Barrel Len.
Caliber
Type of Feed
Other

139413

.243

bolt

~~prod. steel~~ # 5
Powder metal 10050 R.

Date 6-1-66

Firing Pin Indent (Inches)
Before

1 .019
2 .019
3 .0195
4 .019
5 .019

Avg. of 5 .0191
Max. .0195
Min. .019
Ev. .005

Firing Pin Indent
After

1 .019
2 .020
3 .0195
4 .019
5 .019

Avg. of 5 .0193
Max. .020
Min. .019
Ev. .001

661. 139413

Test - I - OK

Test - II - OK

" - III - OK

" - IV - OK

" - V - OK

" - VI - A. 1 - OK

2. - first drop bolt jammed open

3. bolt jammed open on third drop.

4. - OK

Date Received 5-31-66

Model 700

Description

Barrel Len.

139298

Caliber

.243

Type of Feed

bolt

Other

NEW P.M. SCAR #1

Date 6-2-66

Firing Pin Indent (Inches)

Before

1 .019
2 .018
3 .0175
4 .0185
5 .0185

Avg. of 5 .0185

Max. .019

Min. .017

Ev. .01

661 # 139298 new rear

Test - I - OK

" II - A.

1. - on first drop rear sight broke off
2. - OK
3. - OK
4. - OK.

" III - A. 2. on second drop bolt jarred open

" IV - OK

" V - OK

" VI - A.

1. on second & third drops safety was jarred to "ON" position
4. on third drop bolt jarred open

Wbl. - # 139413 new gear.

this gear is very loggy

Test - I - OK

" - II - OK

" - III - OK

" - IV - OK

" - V - OK

" - VI - A.

1. - on first & third drops saftery moved
to "ON" position.

cc: J.W. Brooks

Ilion, New York
July 11, 1966

MEMORANDUM

TO: C. B. Workman

FROM: A. A. Hugick

POWDER METAL ENDURANCE TESTING

A 100,000 cock-and-fire dry cycle test was run on the M/700 FN sear in the Measurement Lab dry cycle machine. The hardness of this sear was measured as 88.5 - R15N. Initial radius at the connector edge was measured as .0013" on the optical comparitor. The radius was measured as .0033" at the dry cycle test completion. All dry cycle testing was conducted with the sear lubricated with lubriplate.

Initial test trigger pull as adjusted by production was 4.55 lbs. During the dry cycle testing two firing pin tips broke. (at 20,000 and 60,000).

AAH:c



M100. PM SEAR
100,000 COCK-AND-PISTON
DRY CYCLES - WELL
LUB.
88.5 - R15N
48.5 MEAS. RC.
10013 RAD. AT
COM MOTOR - INITIAL
10033 RAD. AT
COM MOTOR - TERMINAL
6-27-66 AAM.

