Ilion, New York
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PROGRESS REPORT

MODEL 721-722 FIRE CONTROL AND SAFETY

INTRODUCTION

Three field complaints have been received which reported the M/"21 Bolt Action Rifle firing when the Safety is moved to the "off" position. Two guns representing two of the complaints were tested at Ilion without it being possible to reproduce the defect.

It is, however, theoretically possible under very remote conditions to experience this problem and the Ilion Design Meeting of July 15, 1948, recommended that an immediate investigation be made to develop an alternate design which would eliminate the hazard.

OBJECTIVE

It has been the objective of this study to prepare alternate designs of the Model 721-722 fire control and safety to eliminate any theoretical possibility of the gun firing when the safety is moved to the "off" position and to maintain insofar as practical the present desirable features of the trigger.

The only apparent method of assuring a "fool-proof" design, in view of Swebilius Patent No. 2,191,521 assigned to the Western Cartridge Company, has been the consideration of Safeties which positively block the trigger.

SUMMARY AND CONCLUSIONS:

Three alternate designs have been derived from this study as follows:

Type I is an entirely new type of safety with, we believe, patentable novelty. It operates by blocking the trigger connector with a ball bearing between the trigger connector and an extension on the sear. Easy safety operation is obtained. On the currently manufactured trigger assembly, the present feature of blocking the firing pin is eliminated and accounts for easy safe operation. A model of this design is available for examination.

Type II maintains the current trigger assembly design and adds the feature of blocking the trigger prior to the operation of blocking the firing pin. A model of this design is available for examination.

Type III eliminates the current trigger feature of blocking the firing pin and substitutes a block on the rear of the trigger. This design is a simplification of the Type II proposal and has the advantage similar to Type I of eliminating hard safety operation.

The economics of each trigger type are as follows:

	Present Design	Proposed Type I	Proposed Type II	Proposed Type III
Expenditures to Date	----	($3,000 on all Proposed Design)		
Expenditures to Complete	----	$21,380.	$ 7,800.	$12,900
Standard Material	$30.588/100	$34.105/100	$34.038/100	$29.358/100
Standard Labor	$25.268/100	$27.262/100	$29.238/100	$25.565/100

RECOMMENDATIONS

In view of the lack of additional complaints covering the question of the Model 721 firing when moving the safe to the "off" position and the inability to duplicate the complaints received from the field, we recommend that action be considered as follows:

1. Consideration be given to maintaining the current M/721 trigger "as is".

2. If a change is to be made to eliminate any remote theoretical possibility of the gun firing when moving the safe to the "off" position, we consider type I which in our opinion is the best design. Its disadvantage lay in the high expenditure required to make the conversion.

3. Consideration of the Type III design for the lowest product cost with adequate safety.

4. Last, the consideration of the Type II design. A "hard safety" would always be prevalent in this version as well as high product cost. This design is presented primarily to give Sales an opportunity to maintain their advertising feature of the safety blocking the firing pin.

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MODEL 721-722 ALTERNATE SAFETY DESIGNS
Expenditures Required

	Type #1	Type #2	Type #3
Processing	$ 750	$ 375	$ 500
Design - Fixtures, Tools, Gages	3,200	950	1,880
General Engineering & Administration (1/3 of Design & Process Cost)	250	125	165
Build - Fixtures, Tools, Gages	11,100	3,320	6,100
Tool Design Revisions (approx 20% Design)	640	190	375
Tool Revisions (Tool Design Revisions x 3.50)	2,240	665	1,300
Trial Run Machine Operations, Machine Setters, Machine Operator	2,200	1,175	1,600
Design Cost to Complete	1,000	1,000	1,000
	$ 21,380	$ 7,800	$ 12,920

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MODEL 721 MODIFICATION OF SAFETY DESIGN
Material & Labor Cost per 100

Part Name	Present Design		Type #1 Proposed Design		Type #2 Proposed Design		Type #3 One Piece Sear	
	Material	Labor	Material	Labor	Material	Labor	Material	Labor
Trigger Connector	4.200	.016	6.000	.016	4.200	.016	4.200	.016
Trigger Spring	.335	------	.335	------	.335	------	.335	------
Trigger Adj. Screw	.580	.011	1.500	.020	.580	.011	.580	.011
Trigger Stop Screw	.325	.009	.500	.015	.325	.009	.325	.009
Safety Adj. Scr. Lock Nut	--------	------	--------	------	1.500	.010	1.500	.010
Safety Pivot Pin	.588	.006	1.000	.006	.588	.006	.588	.006
Sear Spring	.360	------	3.000	------	.360	------	.360	------
Sear	3.200	1.329	.900	5.101	3.200	1.329	.900	2.601
Fire Control Housing	2.200	5.308	2.200	5.750	2.200	5.308	2.200	5.308
Safety	2.000	3.559	2.500	3.559	2.500	4.059	2.500	4.059
Trigger	11.300	.015	11.300	.765	12.000	1.765	12.000	1.765
Safety Cam	2.380	2.590	--------	------	2.380	2.590	--------	------
Sear Assembly	--------	1.105	--------	------	--------	1.105	--------	------
Trigger Adj. Screw Jam Nut	--------	------	1.500	.010	--------	------	--------	------
Safety Ball	--------	------	.250	------	--------	------	--------	------
Safety Adj. Screw	--------	------	--------	------	.75	.010	.750	.010
Trigger Guide Plate	3.120	.020	3.120	.020	3.120	.020	3.120	.020
Trigger Housing Assembly	--------	11.300	--------	12.000	--------	13.000	--------	11.750
	30.588	25.268	34.105	27.262	34.038	29.238	29.358	25.565

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TYPE I - CONNECTOR BLOCKING SAFETY

Parts Change Summary

Following is a list of new parts required for the proposed Blocked Connector Safety and the parts obsoleted by their use:

Proposed Parts	Current Parts
A-18498-X Trigger Connector	A-17050 Trigger Connector
A-18499-X Trigger Spring	A-17978 Trigger Spring
A-18500-X Trigger Spring Screw	A-17049 Trigger Adjusting Screw
A-18501-X Trigger Stop Screw	A-17053 Trigger Stop Screw
A-18502-X Safety Pivot Pin	A-17043 Safety Pivot Pin
A-18503-X Sear Spring	A-17047 Sear Spring
B-18504-X Sear	2B-17946 Sear
C-18505-X Fire Control Housing	C-17039 Fire Control Housing
C-18506-X Safety	C-17040 Safety
C-18507-X Trigger	C-18442 Trigger
A-18508-X Safety Ball	

New or revised tooling is indicated on all of these parts, the approximate extent of change being as follows:

Trigger Connector - A-18498-X:

A swaged projection has been added to the lower end of the part, a ground surface provided at 5° to the front face and the location of the hole changed.

Trigger Spring - A-18499-X:

One half turn removed to shorten spring.

Trigger Spring Screw - A-18500-X:

An internal-external threaded bushing replaces one of the current trigger adjusting screws.

Trigger Stop Screw - A-18501-X:

Revision in dimensions of current part.

Safety Pivot Pin - A-18502-X:

Addition of annular groove to current part.

Sear Spring - A-18503-X:

Torsion spring replaces present compression spring.

Sear - B-18504-X:

Contour of lower surfaces modified to provide a downwardly projecting lug at front, a spring support at rear, and suitable ground surfaces to cooperate with connector and ball.

Fire Control Housing - C-18505-X:

Remove tabs that retain current trigger stop screw; provide a single tab at lower position and provide slot in right hand side of housing.

Safety - C-18506-X:

Remove cam on inside leg and provide inturned slotted lug at front.

Trigger - C-18507-X:

Grind revised contour on front and top of present trigger as blank.

Safety Ball - A-18508-X:

Additional.

Trigger Stop Screw Jam Nut - A-18511-X:

Additional.

TYPE II - TRIGGER BLOCKING SAFETY

Parts Change Summary

Following is a list of new parts required for the proposed Trigger Blocking Safety. This design is presented primarily with the idea of maintaining the present sales promotion feature of blocking the firing pin as well as the trigger.

Proposed Parts	Current Parts
Safety	C-17040 Safety
Safety Adjusting Screw	
Safety Adjusting Screw Lock Nut	
Trigger	C-18442 Trigger
Trigger Guide Plate	B-17055 Trigger Guide Plate

New or revised tooling is indicated on all of these parts, the approximate extent of change being as follows:

Safety - C-17040:

A projection is added with an acting surface which alters the safety contour.

Safety Adjusting Screw:

Additional.

Safety Adjusting Screw Lock Nut:

Additional.

Trigger - C-18442:

A projection is added on the rear of the trigger and a drilled and tapped hole provided in the projection.

Trigger Guide Plate - B-17055:

The trigger slot in the guide plate is lengthened.

TYPE III - SIMPLIFICATION OF TYPE II

Parts Change Summary

Following is a list of new parts required for this proposed design of a Trigger Blocking Safety. The design eliminates the sear and safety cam combination and no longer blocks the firing pin as does the Type II Trigger. The safety operation blocks the trigger only.

Proposed Parts	Current Parts
Safety	C-17040 Safety
Safety Adjusting Screw	B-17945 Safety Cam
Safety Adjusting Screw Nut	B-17946 Sear
Sear	C-18442 Trigger
Trigger	B-17055 Trigger Guide Plate
Trigger Guide Plate	

New or revised tooling is indicated on all of these parts, the approximate extent of change being as follows:

Safety - C-17040:

A projection is added with an acting surface which alters the safety contour.

Safety Adjusting Screw:

Additional.

Safety Adjusting Screw Lock Nut:

Additional.

Trigger - C-18442:

A projection is added on the rear of the trigger and a drilled and tapped hole provided in the projection.

Trigger Guide Plate - B-17055:

The trigger slot in the guide plate is lengthened.

Sear - B-17946:)
Safety Cam - B-17945:)

These two stamped pieces are combined as one machined piece whose outside contour duplicates the present sear.

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