

Section I

Trigger Block Design

Part I

December 3, 1946

TO: P. B. Burkhardt

FROM: W. H. Walker

SUBJECT: THEORETICAL UNSAFE CONDITIONS OF M/72 SAFETY

Straight calculation of the amount the Safety lifts the Bear off the Trigger gives a max. lift of .0147" and a min. lift of approx .0021". However, fourteen (14) different dimensions are used in the calculation. The actual amount of lift by statistical analysis would be a max. of .009" and a min. of .0037".

Objections have been raised to the above theoretical unsafe condition. According to L. T. Murphy, the necessary dimension changes on the Bear to eliminate this condition can be made without changes to tooling or gaging. With a minimum lap of .076" between Bear and Firing Pin head the change can be made by changing the depth of grind on the Bear notch.

This change will be incorporated in the drawing as soon as tool procurement is completed.

W. H. Walker
W. H. Walker,
Design Section,
Arms Technical Division

WHL:J

AL 0031916

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DAILY PROGRESS REPORT

SUBJECT M/721 Pilot Line Inspection

Date 4/9/47

There is evidence from the functioning of the above mentioned guns that the Connector, Safety Cam and Bar are not within design limits. This situation can be very dangerous from a safety and functional point of view and the existing condition has caused the following listed malfunctions to occur in several guns that were inspected:

1. Firing Pin moves forward during the bolt locking cycle.
2. Possible to fire the gun by pushing the Safety to the "off" position.
3. Occasionally the firing pin moves forward during the bolt locking cycle.

From the inspection standpoint, situation #3 should be considered the most dangerous in that the malfunction might not occur during the relatively few cycles that the gun would be functioned during inspection.

W. E. Leek
Test Engineer

PLANTIFFS
EXHIBIT

3083

AL 0023239

UNITED STATES PATENT OFFICE

2,514,981

FIRING MECHANISM FOR FIREARMS

Merle H. Walker and Philip R. Haskell, Ilion,
N. Y., assignors to Remington Arms Company,
Inc., Bridgeport, Conn., a corporation of Dela-
ware

Application February 12, 1948, Serial No. 7,778

5 Claims. (Cl. 42-201) 70

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This invention relates to firearms and has particular reference to means for controlling the firing thereof.

Many well-known firearms employ a breech closing bolt which has a reciprocating movement in opening and closing the breech and which may be locked in the closed position by any suitable means. Most of these firearms are provided with spring-urged bolt mounted strikers or firing pins and depend upon means relatively fixedly mounted in the receiver to engage the firing pin or an extension thereof to restrain it against forward movement and to insure trigger controlled release when such release is desired. It is to this type of firearm that our invention is particularly applicable.

A suitable fire control for a firearm of this type provides readily operable means for locking the firing pin positively in a "Safe" position as well as a trigger controlled sear to permit the instant release of the firing pin when it is desired to fire. The value of any safety is proportional to the positiveness of its action. To this end we have found it to be essential that the safety means be so arranged that an inadvertent operation of the trigger while the safety is in "Safe" position will not condition the arm to fire upon release of the safety. The value of any type of sear mechanism is proportional to the degree in which it provides for facile, clean, release free from the disturbing effects of drag, creep, or slap.

It is an object of our invention to provide a fire control having a safety which operates by positively moving the firing pin rearwardly out of contact with the sear and there releasably retaining it. In this way, should the trigger be operated while the safety is engaged, the trigger and sear springs will immediately reposition the mechanism to catch the firing pin upon release of the safety.

It is a further object of this invention to provide a sear and control therefor which operate on barely perceptible movement of the trigger, yet releases the firing pin instantly and completely.

It is contemplated that these objects may be best attained by mounting on the receiver a housing containing two similarly shaped members engageable with the firing pin in such a way that the firing pin energy urges the members to move out of opposition thereto. One of these members may be conveniently identified as a safety cam and the other as a sear. A safety piece arranged to move into contact with the safety cam and a trigger assembly arranged to releasably oppose disengaging movement of the sear, provide for controlling the movement of these members, and through them the firing pin is controlled.

The exact nature of the invention as well as

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other objects and advantages thereof will become more clearly apparent from consideration of the specification referring to the accompanying drawings in which:

Figure 1 is a vertical, longitudinal sectional view of a portion of the assembled rifle action.

Figure 2 is a rear elevational view of the receiver and trigger housing assembly.

Figure 3 is a vertical, transverse sectional view on the line 3-3 of Fig. 1, the stock and trigger guard having been removed to correspond with Fig. 2.

Figure 4 is a partial left side elevational view of the receiver and trigger housing assembly.

Fig. 5 is a right side elevational view of the fire control assembly, the right-hand side plate and elements supported directly thereon having been removed for clarity in illustrating the interior construction.

Fig. 6 is a vertical sectional view taken on the line 6-6 of Fig. 5.

Referring to the drawings by characters of reference, it may be seen that the portion of a rifle action which is illustrated comprises a receiver 1 which serves as a housing for a conventional type of upturn and pull back bolt 3 and as a mounting for a trigger housing 4. In the usual fashion the rear end of the bolt is closed with a bolt plug 5 which serves as an abutment for the main spring 6 and as a guide for the firing pin 7. Secured on the rear end of the firing pin by a cross pin 8 is a firing pin head or cocking piece 9. The cocking piece is formed with a rib 10 which is slidably received in a groove 11 in the receiver and with an angularly disposed sear engaging face 12.

A longitudinally extending mortise 13 is milled through the bottom wall of the receiver to accommodate the trigger housing 4 which is secured therein by cross pins 14 and 15 mounted in the receiver and passing through the trigger housing assembly to serve as pivots and stops for elements therein.

Between the side plates of the trigger housing which may be conveniently blanked and formed from a single piece of sheet metal, the front cross pin 14 pivotally supports the sear 16 and the safety cam 17. Each of these members occupies substantially half of the width between the side plates and in their top contour they are substantially identical. They are provided with similar striker engaging faces 18 and 19, the angular relationship between these striker engaging surfaces and the sear engaging face 12 being such that there is a tendency for sear and safety cam to swing counter-clockwise about the pivot pin 14 under the urging of the main spring 6 which acts through the firing pin 7. Such an angular relationship between the engaging faces and the radius passing through the contact point is com-

CC: S.M. Alvis
D.S. Foote

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REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington

PRIMS

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

August 12, 1948

TO:

M. L. Walker
H. V. Young

FROM:

H. A. Brown

SUBJECT:

Model 721 - MODIFICATION OF SAFETY DESIGN

Please furnish me as soon as possible a report showing the extent of modification to parts involved in your proposed design of Safety.

Please arrange this in as much detail as possible, to be used as a basis for economic evaluation. It should show the change in Parts List, including obsolete parts, new parts, and modification to existent parts, and indicate whether new material specifications will be required.

I would appreciate it if you would furnish this information as promptly as possible.

H. A. Brown
H. A. Brown, Manager
Arms Technical Division

HAB:LJ

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AL 0022931

INTERIM REPORT

9/15/48

SUBJECT: FUNCTIONAL AND ENDURANCE TEST OF STANDARD FIRE CONTROL
AND ALTERNATE SAFETY TYPE #1 FIRE CONTROL FOR M/721-722 RIFLES

INTRODUCTION

Firing of M/721 rifles when the Safety is moved to the "off" position is the complaint received from three customers, which resulted in an investigation of the present fire control. As a result of this investigation an alternate design incorporating a ball bearing between the Trigger and Connector and an extension on the Sear was constructed and submitted for test.

OBJECTIVE

The objective of this test was to determine if the gun will fire when the Bolt is cocked and the Safety is moved to the "off" position by submitting the standard fire control and the alternate Safety Type I Fire Control to a functional and endurance test.

CONCLUSIONS

1. Both fire controls will not fire when the Bolt is cocked and the Safety is moved to the "off" position after 20,300 dry cycles of cocking and firing, and 10,000 dry cycles of functioning of the Safety.
2. That the Trigger Stop Screw in both Fire Controls needed adjusting and correcting during the test.

COMMENTS

Correct adjustment of the M/721 Fire Control is essential in providing a clean, crisp trigger and one with enough Sear engagement to prevent accidental discharge caused by a "jar off" condition. The adjustment in the present fire control is variable and is determined by the assembler, whereas the adjustment in the alternate Safety Type I Fire Control is determined largely by dimensions of the various parts and a control of the adjustment by the limiting dimensions of a ball bearing.

AL 0031905

RECOMMENDATIONS

It is recommended:

1. That use of the present M/721 Fire Control be continued as results fail to indicate any need for a change.
2. That the Type I Safety (ball bearing between the Trigger and Connector) be considered in any future design change of the M/721 Fire Control as its adjustment characteristics are superior to the Fire Control now used.
3. That the present practice of cementing the Trigger Screws be supplemented with a positive locking mechanism and that this locking mechanism be sealed with a sealing compound before shipment of the gun to the customer.

TESTING DETAILS

1. One of each of the subject fire controls was tested functionally by three individuals of the Test Group. These tests were as follows:
 - a. Drop Test - The gun was dropped and allowed to fall freely for a distance of 10". Repeat 10 times.
 - b. Cock the gun, position the Safety to the "on" position, pull the Trigger, release the pressure exerted by the finger on the Trigger, and position the Safety to the "off" position. Repeat 25 times.
 - c. Cock the Bolt and slam the Bolt forward. Repeat 25 times.
2. Both fire controls were then subjected to 10,000 functions in the dry cycle machine which cocks the Bolt and fires the Trigger. The Safety was then functioned 10,000 dry cycles. Repeat a, b, and c of Test I.
3. Both fire controls were subjected to a standard dust test after which an additional 10,000 dry cycles of Bolt, Trigger and Safety functioning were performed. Repeat a, b, and c of Test I.

RESULTS OF TEST

1. It was not possible in this test to fire either of the fire controls by moving the Safety to the "off" position when the fire controls are in adjustment.
2. Both Fire Controls would not stay in adjustment until after a second application of pressure was made during the first 10,000 dry cycle period.

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Type III eliminates the current trigger feature of blocking the firing pin and eliminates a block on the rear of the trigger. This design is a simplification of the Type II proposed 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	---	\$21,390.	\$ 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 disadvantages 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.

D. S. Fouts
D. S. Fouts
Design Unit
Arms Technical Division

DSF:R.
S/16/13

AL 0031909

Union, New York, August 3, 1948

TO: John H. Lewis, Jr.

FROM: E. F. Young

SUBJECT: INVENTIONS REPORT - IR-74
Model 721 - SAFETY

Inventor: (Ball Connector Block)
E. F. Young

DESCRIPTION:

The accompanying drawing, L-615, shows a Safety in which a floating ball is employed to block the Model 721 Connector in gear engagement.

In detail, the Gear, similar to the former one-piece M/721 Gear, has a downwardly projecting lobe (1) with a rearwardly facing ground surface (2) inclined rearwardly at about 9° from perpendicular; the connector has a forwardly facing ground surface (3) which is parallel to the surface (2) on the gear when the connector is in engagement with the gear at (4). The safety (5) has an inwardly turned slotted end (6) which is adapted to swing within the arcuate opening (7) in the side of the bearing (8). The slotted end of the safety is adapted to engage a ball (9) and move it upwardly between the gear face (2) and the connector face (3), the ball being of such size that when interposed between the gear and the connector, the edge (10) of the connector will have a minimum engagement with the gear at (4) to provide requisite safety. Notating the safety forward brings the ball to the position shown by dotted lines at (11) at which point sufficient space is provided between the turned-in tab (12) and the connector to prevent interference.

A spring (13) is provided to urge the gear upward.

Other parts of the mechanism are similar to the current Model 721 Fire Control. One difference being the location of the trigger stop screw (14) which currently is located at a higher point. Another change is involved in the front and top profile of the trigger to provide clearance between it and the connector, except at the contact points A, B and C, and in the provision of a rearward projection at the bottom of the connector to prevent excessive upward movement of that member. Currently, the trigger stop pin serves this purpose in conjunction with a through hole in the connector.

A model now being made up deviates from the accompanying drawing in that the safety member has a "U" shaped loop at the rear which provides a double bearing surface for the safety, practically as now provided in the M/721.

AL 0015208

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John H. Lewis, Jr.

- 2 -

August 3, 1948

SUBJECT:

INVENTIONS REPORT - IT-74 - MODEL 721 SAFETY

The present proposal provides retention of a connector similar to the present M/721 structure and utilizes a means of blocking this member in safe position.

Inasmuch as all of the parts directly involved (Sear, Connector, and Ball) are hardened parts and as the surfaces involved can be finished by grinding, very close tolerances can be held and since the only two part tolerance combination includes the ball, which can be purchased with negligible tolerance, interchangeability should be expected with a total tolerance of about $\pm .002"$.

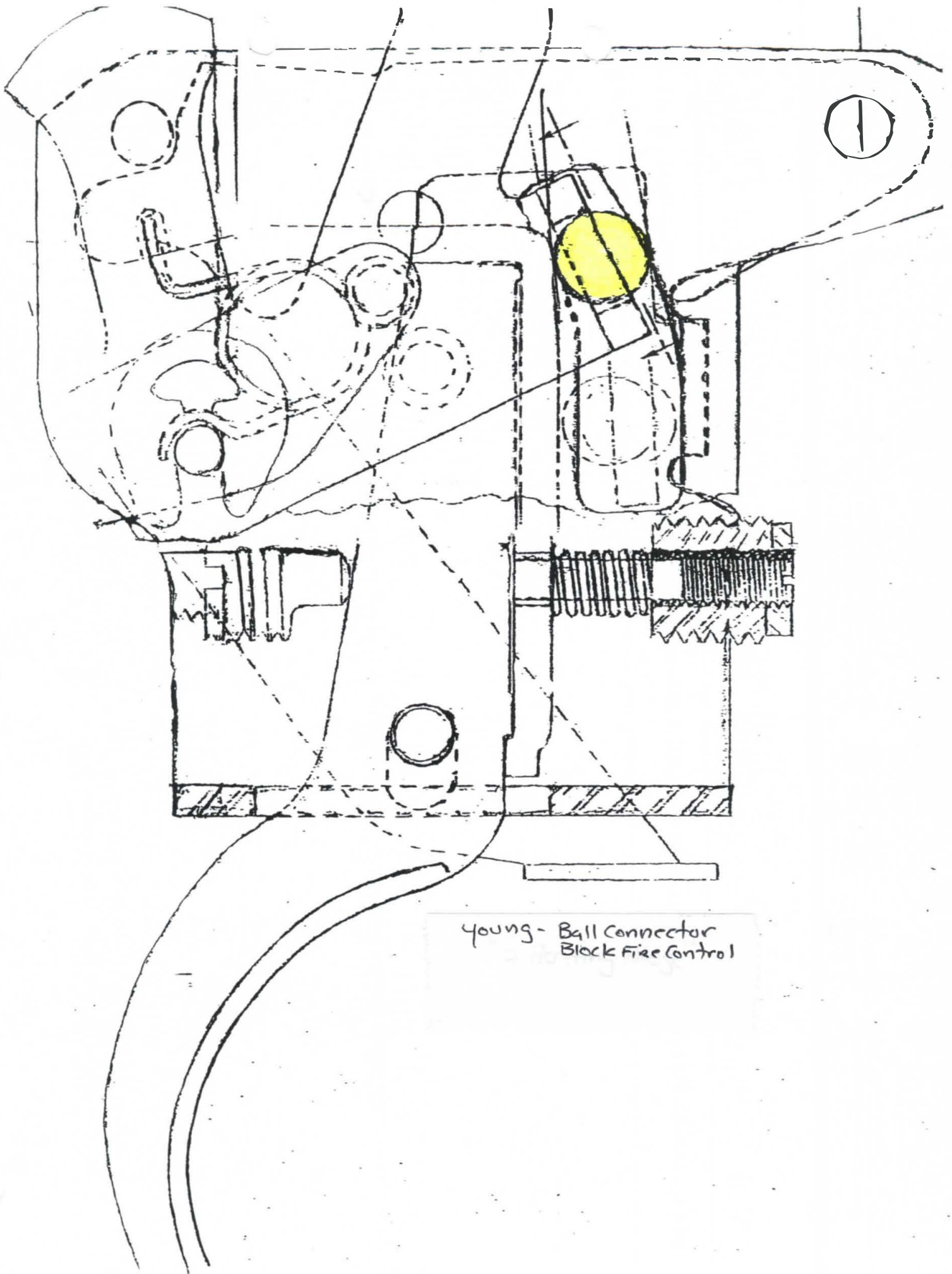
We would like a report as soon as possible covering the infringement aspects of this mechanism.

H. W. Young,
Design Unit,
Arms Technical Division

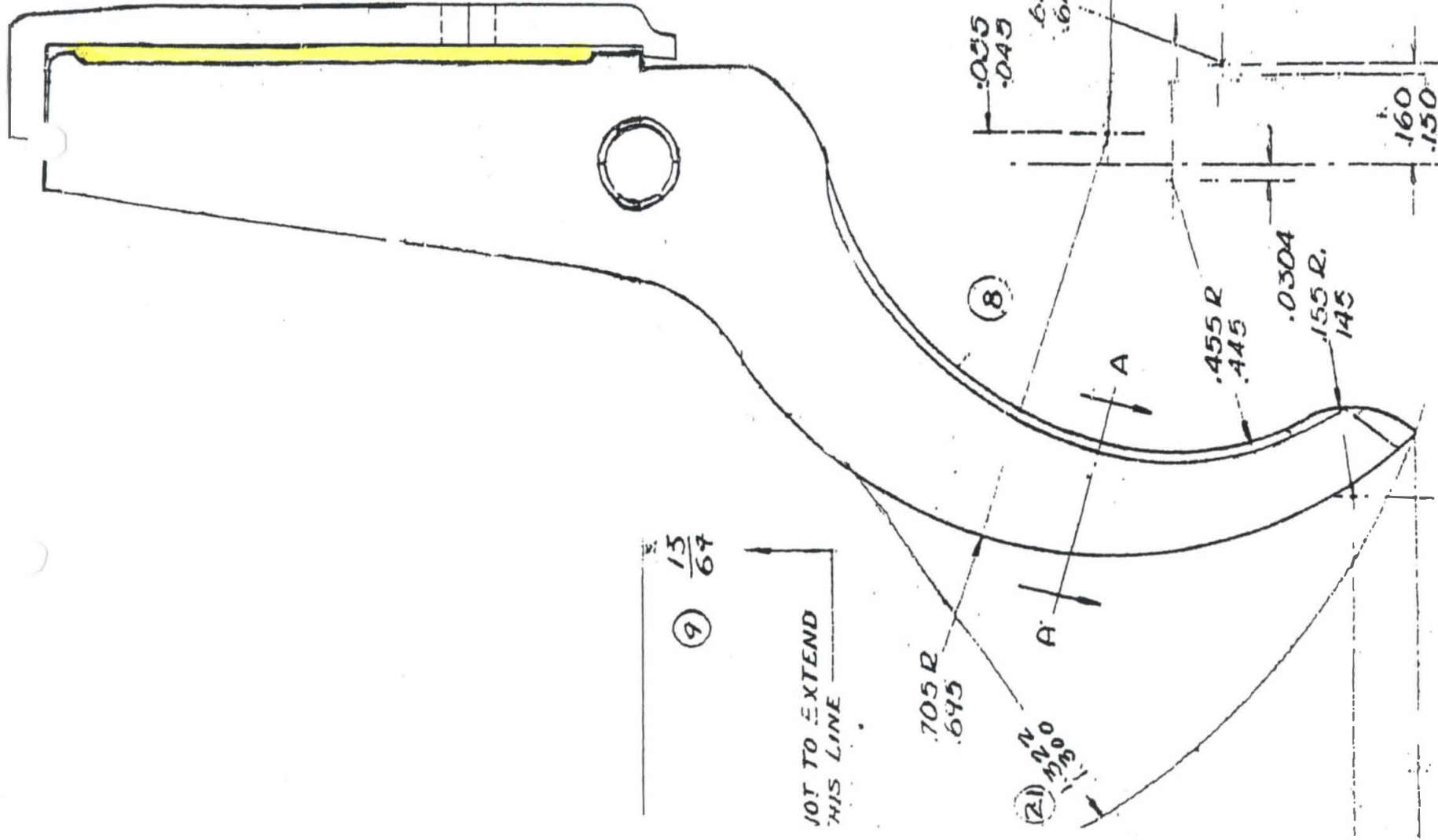
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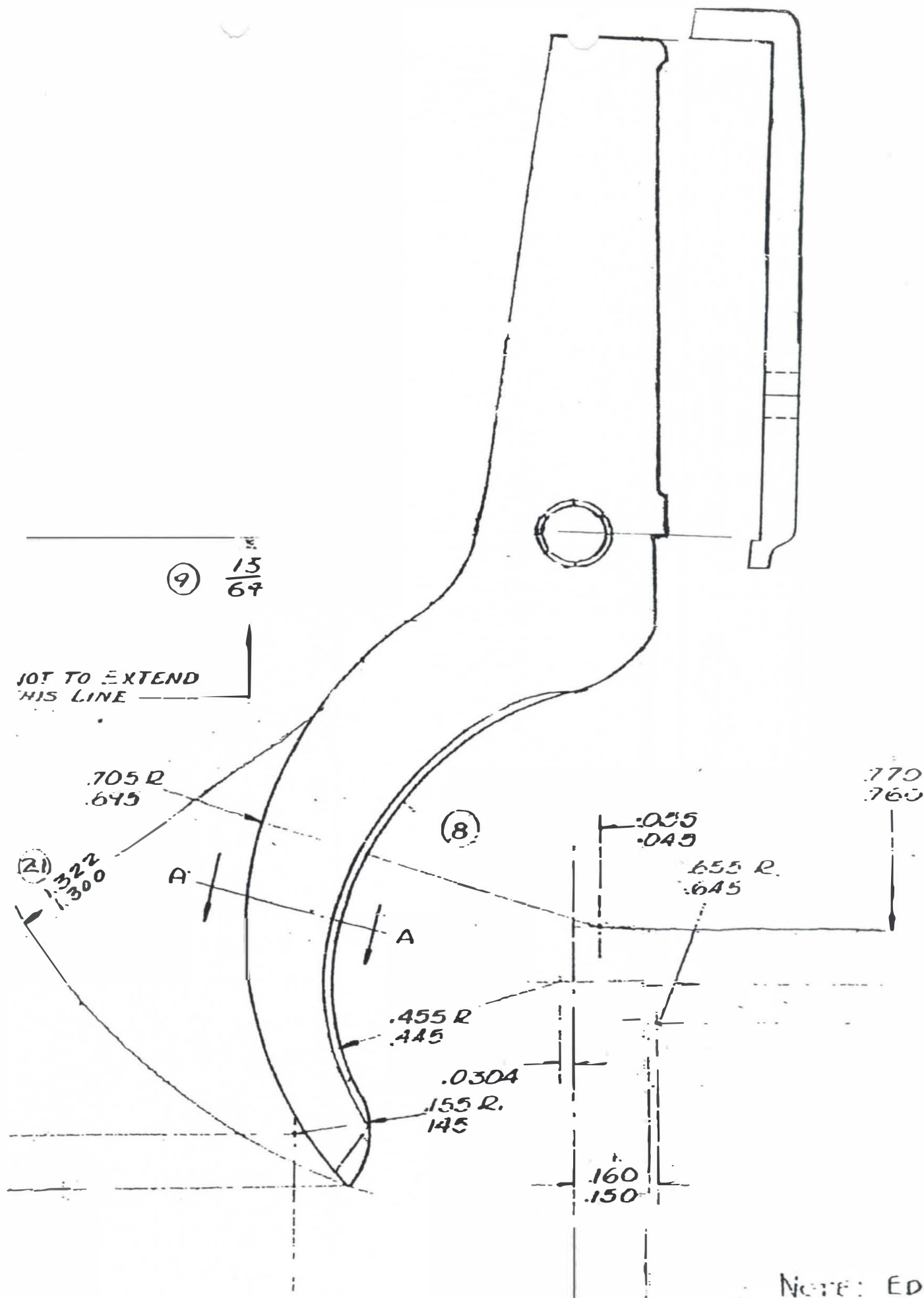
AL 0015209



Young - Ball Connector
Block Fire Control



Note: ED



REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington

OUTPORT

PETERS

OUTPORT

Bridgeport, Connecticut,

August 31, 1948

TO: MR. S. M. ALVIS,

From: Mr. A. J. Greene,

Subject: MODEL 721 SAFETY

The gun mentioned in your letter of August 27th was duly delivered to us by Mr. Pinckney, and is returned to him with his copy of this letter. We are unable to secure a malfunction of its safety, and deem its construction a substantial improvement over the model which we had previously examined.

Our usual potential liability for the safety of our product is somewhat augmented by our knowledge that some Model 721 safeties have malfunctioned. However, our liability does not seem to be out of proportion to the advantage of retaining the present sear and safety construction, pending receipt of further complaints from the field.

We note that in the production gun which you supplied the three adjustment screws in the trigger assembly are not staked, as they were in the earlier models. We believe it important that these screws, particularly the one which determines the amount of engagement of connector and sear, be so sealed as to afford a positive indication when our factory adjustment has been altered.

AL 0031902

A. J. Greene
A. J. GREENE,
Patent Attorney.

AJG/m

out
B
Worship
Notification
H.S.N. - 4/7/48
1:30 P.M. - 4/1/48