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SUBMITTED TO:

ARMED SERVICES TECHNICAL
INFORMATION AGENCY
ARLINGTON HALL STATION
ARLINGTON 12, VIRGINIA

SUBJECT:

SUMMARY REPORT OF THE
PRODUCTION ENGINEERING OF
THE M57 (T49E1) ELECTRICAL
FIRING DEVICE

CONTRACT:

DA-28-017-ORD-3079

SUBMITTED BY

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APPROVED

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Vice President

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1. INTRODUCTION

A summary is given concerning production engineering of
The T49E1 Electric Firing Device, ~~is~~ ^{it converts} basically ~~a converter of~~

mechanical energy into electrical energy. This conversion is accomplished by triggering an armature through a magnetic field produced by permanent magnets.

It is pointed out that

The orientation of the component parts is vital, and any deviation in position may be enough to restrict the current flow and, *thus,* reduce the output. *X*

Current flow is the result of a sequence of movements that commence when the handle is depressed forcing the cap that rests directly inside the rubber boot and contained within the stainless steel housing.

The cap transmits the force to the two 0.125 diameter steel balls protruding from the actuator head. The balls are held in this extended position by a preloaded spring which tends to push the balls apart.

As this motion continues downward pressure builds up in the two springs. The larger of the two - the actuator spring - is retained on the actuator shank and is compressed between the flat bottom hole in the housing and the actuator head. This pressure continues until the 0.125 balls come in contact with the 45° chamfer of the housing. This inclined plane forces the balls back into their hole and with the pressure of the

actuator spring this part is then driven into the cap.

The second spring - armature spring - is housed in the reamed hole inside the actuator shank. As the actuator travels downward pressure is created through the magnetism in the top pole plate holding the armature which is linked to the spring through the armature pin and support.

This linkage operates through the elongated slot in the armature shank which permits free travel once the magnetic force is broken for the armature to descend to the bottom plate.

This action occurs precisely when the 0.125 diameter steel balls are forced into the actuator head. With increased force the actuator is then thrust back to its initial position by its own spring which completes the cycle.

This vigorous movement of the actuator carries the armature swiftly up and down inside the coil thereby cutting the magnetic field to produce the necessary output.

The speed of this mechanical motion and its effect on the generator output indicate the importance of each phase and the relative effect each component has on its mating part during this fast sequence of operations.

One of the prime requirements in a mechanical complex where metal is moving on metal is friction. Unfortunately, there can be no lubricants used and the actuators prime support is

the hole it passes through on the housing. Any foreign material, improper burr removal or concentricity excess on the trigger section will restrain free movement and slow the whole sequence thus lengthening the pulse.

It is well to note also that tumbling is not a catch-all to remove burrs. If an excess of material occurs due to a dull cutter there is a strong possibility that tumbling willpeen the excess to build up a corner or edge exceeding the machine's surface dimension wise.

Industrial organizations vary depending on the personnel and the equipment. Each one will handle the same task in a similar yet different manner, achieving the same results with varying degrees of trouble depending on each particular organization. A combination of factors in any process can be borderline and create turmoil. Very careful adherence to the principles of machining, observance of proper molding pressures, and mold heat, as well as good housekeeping in assembly departments are some of the basic elements necessary to produce this assembly with the least amount of trouble.

2. MATERIAL NOTES

Function is foremost in every design but without protection from the elements, and abuse, by men and machines there is no function.

This protection is designed mechanically around the mechanism but only careful selection of the materials will give the safety factors that will endure abuse and the elements. Extreme cold exposure is another torture that this assembly must survive adding another element which lessens the number of materials available for selection.

The bulk of the T49E1 Firing Device is housed in a glass filled polystyrene case capable of withstanding all of the previous mentioned conditions. The handle is prominent on the assembly and is also made of glass filled polystyrene.

The prominence of the handle is a definite handicap during the jumble test as it becomes the landing point during this buffeting.

Material thickness on these two parts has been proven sufficient to last through any jumble or drop test to which it might be subjected. There was no penetration of moisture through the walls during the steam and vacuum testing, but the case halves must be completely flat to provide a good seal with the styrene adhesive for moisture protection.

The rubber connector is sufficiently flexible at -45°F to make connection with the initiator cord but cannot withstand flexing other than that. The adhesive specified will provide a complete bond with the polystyrene case with little effort.

The silicone rubber boot is the only rubber that will not become stiff when functioned at the extreme cold temperature. Neoprene rubbers become too stiff and restrict the upward movement of the armature during this cold test. Roughen the rectangular boot section prior to application of the specified adhesive. This will provide a good joint.

Type 416 stainless steel has been specified for the screw machine parts. This particular steel was specified for two reasons. One, it is free machining and with little effort can be finished to design satisfaction. The second reason is its response to heat treatment.

This assembly is required to function five thousand times and have a shelf life of twenty years. The only material that provides these qualities and still lends itself to automatic screw machine production is type 416 stainless steel.

The magnetic iron specified for the top and bottom plates is not available from commercial steel distributors due to the purity of the iron alloy. It is therefore possible to buy this material in large volume and will be produced in a mill run under closely supervised conditions. There is limited effect

felt in the Firing Device out-put due to substitution of a commercial grade iron as compared to the iron as specified.

In the armature, the availability is much the same as the top and bottom plates, but the effect of the commercial grade will reduce the output below the minimum requirements.

3. COIL ASSEMBLY ORDNANCE #8800934

Winding the coil wire on the bobbin requires care as there is very little clearance between the wire buildup for the bobbin length and on the overall height of the six layer buildup.

If too much pressure is exerted during this operation it will tend to crack the plastic bobbin.

The arbor used in turning the bobbin should not be smaller than the minimum hole size to permit some shrinkage to occur after the coil has been fully wound.

When applying the tape start the wind at the side and do not allow more than 0.75" overlap for the best fit with the top and bottom plates.

The purpose of stranded wire soldered to the solid wire was flexibility during the jolt and jumble tests.

Generally on an assembly of this type everything is checked but the solder joints. The two solder joints in this assembly must be checked for strength as well as cold joints.

One operator can produce eight hundred coils in an eight hour day.

4. BOBBIN ORDNANCE #8800929

This part can be molded very well in a multicavity mold mounted in an automatic injection press.

This part is subjected to a relatively high stress after the coil has been wound so if there are any flow lines or imperfections in the molding it will fracture during the winding operation.

If at all possible the rectangular hole should be maintained on the high side of the tolerance and inspection should observe closely the 0.025" thickness dimension to detect any shifting of the male pin.

If the mold section that forms the rectangular opening were to shift it would restrict the armature travel and result in lowered electrical output.

5. PLATE, TOP ORDNANCE #8800938 &
PLATE, BOTTOM ORDNANCE #8800939

These two parts are similar and can be dealt with at one time.

Flux lines travel these two pole pieces lengthwise. To process these parts contrary to these flux lines would result in a considerable reduction in the generator output.

This material, magnetic iron, when annealed has the same machinability as low carbon steel.

An automatic cutoff saw can be setup to cut four hundred pieces per hour with little effort. A blanchard grinding pass on both surfaces will provide a good base for all machining operations. The irregular contour can be machined economically on many of the new high production milling machines or on a ten ton vertical broach. The milling fixture would be comparable in cost to the broaching fixture, but the milling cutters would be cheaper and can provide a 63 finish. To arrive at that same finish on a broaching machine would necessitate two passes which might be as economical as the milling operation due to its faster cycle time. In either case with a conventional setup a production of one hundred sixty pieces per hour would be a good rate for this operation.

Drilling can be done at a rate of 100 surface feet per minute

with a chip load of approximately 0.003". Using a conventional drill point on a high speed steel drill a production of thirty pieces per hour for all holes is possible.

At the conclusion of all machining operations all excessive burrs should be removed using a coarse file. The remaining burrs can be removed by tumbling in a large barrel with abrasive chips in a strong soap solution. The amount of time necessary to remove all burrs will depend on the physical size of the burrs, number of pieces in the barrel, barrel speed and the quality of the abrasive media. All outside corners on both pieces can be ground to approximately 0.01 radius in six hours. Careful cleaning to remove excess grinding dust or abrasive chips from the small holes and especially the tapped holes is required after tumbling.

Heat treatment performed in an artificial atmosphere provides very clean parts that can be effectively plated with little danger of bad plating.

Important factors to be watched during process are the following:-

1. The 63 finish on each of the magnet bearing surfaces.
2. The 63 finish on the $5^{\circ} 30'$ angular surfaces.
3. Removal of burrs after threading on the magnet bearing surfaces.
4. Strict observance of all tolerances.

5. Sharp corner in the coil cutout section.

6. Removal of all burrs.

6. ACTUATOR ORDNANCE #8800937

The Actuator is a key part in the triggering mechanism and requires constant surveillance for all dimensions and finish requirements as specified on the drawing.

The first operation is to centerless grind the bar stock to achieve the necessary tolerance and finish on the head section.

The blank part has been dimensioned to suit automatic screw machines either straight bar machine or multispindle.

Regardless of the production equipment used effective results can be gained by maintaining a rough cutting speed of 140 feet per minute with approximately 0.005 inches per revolution feed. Finishing speed should be about the same as roughing except the feed should be about 0.002 per revolution.

When drilling the 0.212 diameter hole best results can be obtained by rough drilling with a 0.206 drill and finishing with a spiral fluted reamer. The principle purpose of the 32 finish on this hole is to provide a smooth, unrestricted movement of the Armature Spring Support #8800949 with this part. In view of this the 32 finish need not exist beyond 0.875 depth.

To assure accuracy in the orientation of the 0.125 slot with the 0.126 diameter hole a drilling operation should be performed prior to milling. An attempt was made to punch the elongated slot but in each case failed due to interior rod support damage.

It will be necessary to polish the 0.126 diameter hole after heat treatment to remove scale or foreign matter lodged therein. Artificial atmosphere is a must when heat treating, and it will still be necessary to recheck the various finished surfaces due to attack by the inert gas.

7. HOUSING ORDNANCE #8800936

Housing Ordnance #8800936 is made from 416 stainless steel which although free machining does not finish as good as other stainless alloys that are not heat treatable.

A multispindle screw machine is best suited for this part.

In the prototype production all holes were roughed out to within 0.006 to 0.010 of the finished size. A single spiral fluted reamer made the first finish cut followed by a two step reamer that produced the larger holes. Extreme care is mandatory with the edges on each tool to provide the proper margin and a cutting edge with less than a 5 micro inch finish.

The rigidity and horsepower of the production equipment will be the factor that determines the speed and feed to produce this part.

After heat treating in an artificial atmosphere there will be a loss of the original surface finish that will require a polishing operation to restore the original finish. If heat treated by some other method greater effort will be required to bring the part to specification.

The 0.358 diameter section will require annealing prior to assembly with the top plate.

An induction heater similar to Sherman Manufacturing Company
2KW Model will efficiently perform this operation.

8. ARMATURE ORDNANCE #8800940

The first operation on this part is to saw cut to length which can be effectively performed on an automatic cutoff machine. A production of five hundred pieces per hour is nominal.

If it is necessary to use 0.250 thickness material, blanchard grinding will bring the parts to size at a cost of \$0.03 each or less. The length will have to be finished for tolerance reasons but this can be combined with machining the 0.312 inch slot. This machining can be processed on a vertical broach or a fast production milling machine.

The milling or broaching teeth sharpened to a 5 micro inch finish or better will give extended production time. Close observance of all rake and clearance angles is essential.

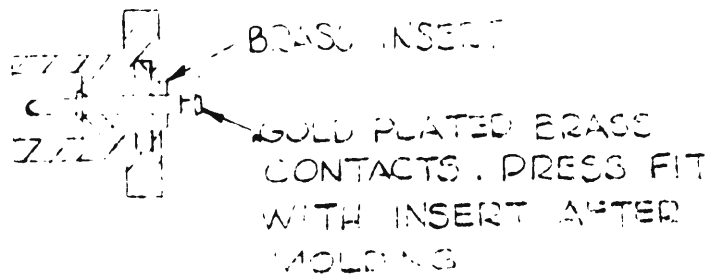
Processing of the 0.06 x 45° chamfers is a separate operation and is a natural for high speed milling.

Due to the regular shape of the Armature, fixturing is a simple operation. A broaching hold-down fixture will cost about five hundred dollars. A gang milling fixture using hydraulic clamping fixtures will compete with the broaching production.

9. CONNECTOR ORDNANCE #8800925

The present design shows a straight pin molded in place and it looks very good. In actual practice a good bit of rubber travels along the pin and is difficult to remove. Any finish that might be present would naturally be stripped off during this deburring operation:

An alternate method is shown here that will cost possibly five cents more but would add to the reliability by providing better contact surface.



The brass insert would be molded in place with a hole through its center large enough to permit the gold plated brass contact to be pressed in after molding. This construction would practically eliminate all deflashing.

Rubber molding is a very competitive business and there is no problem having this part transfer or injection molded of the proper compound.

10. PRONG ORDNANCE #8845192

This is a simple screw machine part that can be produced on a #0 Brown & Sharpe automatic screw machine in six seconds.

Less trouble will be encountered in the connector molding operation if this 0.079 inch diameter be centerless ground to a tolerance of 0.001 inch.

11. SUPPORT, ARMATURE SPRING ORDNANCE #8800949

The design of this part makes it a natural for multispindle automatic screw machine. This part can be completely machined in at this one process. If the 0.209 dimension is processed on a centerless grinder prior to machining it will facilitate the machining and provide a cycle of not more than ten seconds on the automatic screw machine.

12. ARMATURE PIN ORDNANCE #8800943

This part can be cold headed which provides a great savings over screw machine processing.

13. CAP ORDNANCE #8800941

With the exception of the bottom of the 0.468 hole this part requires a fine finish all over to perform its task effectively. Its design lends it to multispindle automatic screw machine which should provide a completely machined part every eight seconds. The drawing does not delineate it but a drill point at the hole bottom whose depth would not be greater than half the thickness is permissible.

Artificial atmosphere heat treatment is the most effective method due to the bright finish afterward. As bright as this finish appears the surface has been disturbed and must be tumble polished to remove this condition.

14. BOOT ORDNANCE #8800927

The reason for choosing a silicone rubber was its flexibility during the cold test. Neoprene rubber was too stiff and in some cases shattered at a temperature of -65°F.

When molded this material will have a durometer reading between 50 and 60 which will provide sufficient abrasive resistance for one thousand actuations without a puncture.

15. HANDLE ORDNANCE #8800928

This is a rugged injection molded design and can be produced on automatic injection machines with a time cycle of one minute.

The position of the gate is critical if it is located on the wide flat surface in back of the 0.218 radius that engages the Boot #8800927.

In the jumble test the whole assembly is bounced about and lands with regularity on the back portion of this part.

Gate sections on filled material moldings tend to be resin rich which lowers the strength of that section. Consequently if the gate on this part should be in that middle section and the impact force taken on the handle end a break occurs through the resin rich area.

The gate should be located opposite the pivot end in the tapered section.

16. RETAINER, BAIL ORDNANCE #8800932

A single spindle or a multispindle machine will produce this part with the exception of one hole.

Time cycle will be no greater than six seconds for the turning operation. Secondary drilling in a semi automatic setup can provide the remaining hole at very low cost.

17. SHIM ORDNANCE #8800930

The tolerances spelled out for this part assure trouble free production from a simple progressive die.

It will be necessary to stress the two bends during the forming operation to insure sharp bends on the finished piece. Proper clearance between the punches and die sections will shear the material without burrs.

A five ton press is sufficient to produce one hundred parts per minute.

Over bending of the $5^{\circ} 30'$ angle is more desirable than under bending and the only other figure that's important is the 0.202 dimension.

18. HANDLE ORDNANCE #8800928

This part is designed for production on a high production injection molding press.

The cross sections appear to be on the heavy side but considering its prominent position in the final assembly the thickness is within reason.

Glass filled polystyrene, although suited for abuse, is very economical for high impact material. There is no other material on the market that offers the combination of low cost, high impact and a relatively stable piece after molding.

On injection molded pieces where filled material is used, one of the characteristics is resin rich areas around the gate section.

With this thought in mind it is best to locate the gate either on the extreme end, by the reinforcing rib or at the opposite end, the fulcrum point. A resin rich area in the center section will break during the jumble test due to bouncing on the handle tip.

19. CASE, RIGHT HAND ORDNANCE #8800947 &
CASE, LEFT HAND ORDNANCE #8837117

When assembled the only difference between these cases is that one is a right hand and the other a left hand.

These parts were designed for production on automatic injection molding machines using the material best suited for the products service. This material known in the trade as "Fiberfil" is best suited in that it has a very high percentage of glass fibers as filler material with polystyrene as a binder. This combination produces an item suited for the roughest service and at the lowest material cost.

The only trouble that can be expected during the molding is warpage. Due to the large cutout and recess in the top section there is a tendency for the case to warp around the hole axis. The heavy section enclosing the connector and the handle reinforcing rib cool slower than that thin section previously mentioned which creates this tendency. Careful heater arrangement will reduce warpage to some extent but in the final analysis a clamp is necessary to assure the flatness necessary in this product.

20. ASSEMBLY NOTES

Preparations for all assembly work should consider that the final assembly will be an accumulation of many parts. Some of which are sensitive to abuse from materials harder than themselves or injury to a surface which raises a burr and prevents the fit required in the design.

The magnetic iron parts are tumbled, annealed and finally plated. The tumbling removes all sharp corners, the heat treatment relieves the stress from machining and the plating provides protection from the atmosphere.

If these parts are indiscriminately mixed with the hardened stainless steel parts there will be a high reject rate of assembled units.

It is also necessary to protect the stainless steel parts from ordinary handling to insure that a hardened corner will not mar a 32 finish surface.

The coil is somewhat deceiving in that it must be wound very carefully or the overall dimensions will be exceeded or that there will be insufficient wire to give the required resistance reading.

The connector should be soldered to the coil leads prior to assembly into the case.

When performing the armature assembly, each item should be oriented with the top and bottom plates, so that there is no over hang of the magnets, armature or other components to interfere with the case.

It is well to check at this time the contacting of the armature with its all four mating surfaces on the top and bottom plates. The armature should completely contact the whole angular surfaces of both top and bottom plates to the extent that there is no passage of light through this mating. Should the sub-assembly fail to pass this inspection investigation of the cause and preventive measures should be initiated.

Some of the reasons that can cause this mismating will be found in tolerance violations of the two plates, out of center condition of the coil bobbin or some other obvious reason.

This is one area where an excessive metal condition was supposedly removed by tumbling and a buildup on a corner prevents the armature from laying flat on its mating surface.

It is possible to split or crack the coil bobbin during storage or in handling which is another area to investigate. The pressure exerted during coil winding is great and creates a stress on the polystyrene material and the normal temperature variation can be enough to damage this part.

The assembly fixtures as shown in the Description of Manufacture perform very well during the assembly of screw

machine parts.

The following sequence was effective at this portion of the assembly.

Assemble on the Actuator #8800937 the Ball Latch Spring #8800944 and two Balls #8837122 one in each end of their hole and retain by using a cap similar to Cap #8800941 except that the overall length is longer by 0.5 inch.

The operator should then assemble the Armature Spring #8837123, Armature Spring Support #8800949 and the Actuator Spring #8800945 in their respective positions. As this combination of components are threaded into the housing they will remain oriented and if the 0.125 slot in the actuator is aligned properly it will aid in mating in subsequent operations.

The right hand fixture clamp will compress the actuator spring and hold the actuator slot midway between the top and bottom plates. Pressure on the armature spring is created by the left hand fixture and will move the spring support until it is available for orientation with the Armature #8800940.

A small pick will be necessary to completely align the armature support with the actuator's elongated slot and the holes in the armature. A tapered dowel makes an effective drift pin to precede the Armature Pin #8800943 which will then slip through without effort. The two fixture clamps can then be removed and the Retaining Ring #8800946 can be

inserted on the armature pin.

Prior to removing from the fixture, the right hand clamp should actuate the assembly several times to insure that it will function.

The above assembly appears to be very involved but an average operator working steadily can produce forty units in one hour.

In sequence the next operation assembles the remaining parts and magnetizes the unit.

The assembly is placed in the magnetizing jaws and current is induced for approximately thirty seconds. Immediately on removal the assembly should receive the Cap Spring #8800948, Cap #8800941 and Boot #8800927. The Connector #8800925 should be twisted 180° to eliminate slack in the leads and then placed in the Case #8800947. A Handle Assembly #8837120 should then be mounted and a Case #8837117 added which then encloses the assembly. The unit should then be actuated and checked for output. The output recorded at this point is indicative but will be slightly higher than that when the assembly is sealed closed.

If the unit performs to the standard the case should be re-opened and the boot and connector removed. Recesses for the rubber parts should then be coated with the proper adhesive as well as the parts themselves. Mating faces of the cases should

very carefully be coated with the styrene cement with special care at the thin sections as this forms the shortest path for moisture. The Bail #8800933, Bail Retainer #8800932 and the Bail Spring #8800935 should then be assembled and the case closed. The Screws #8800914 and Nuts MS35640-66 are used to secure the assembly.

The areas that most directly effect the output are in the actuator spring section or in the armature spring section. In the springs themselves are many variations that occur and can only be detected by close observation. Tolerance on the spring length, angular variation between the spring axis and the end flats, and the pitch of the coils are each capable of error and when two of these variations appear on a single part they will lead to malfunction of the assembly. Loose particles of metal or plastic can be the cause of output failure. A bad solder joint at any junction is another point of investigation for output drop.

The adhesives used in sealing the case and overcoating the seam if not handled properly will find its way between the handle and case or in the sides of the well into which the handle reinforcement enters. These points will retard the free travel of the handle and consequently the actuator.

A simplified test of the alignment of both case halves and the handle assembly is to assemble all three parts and lift the

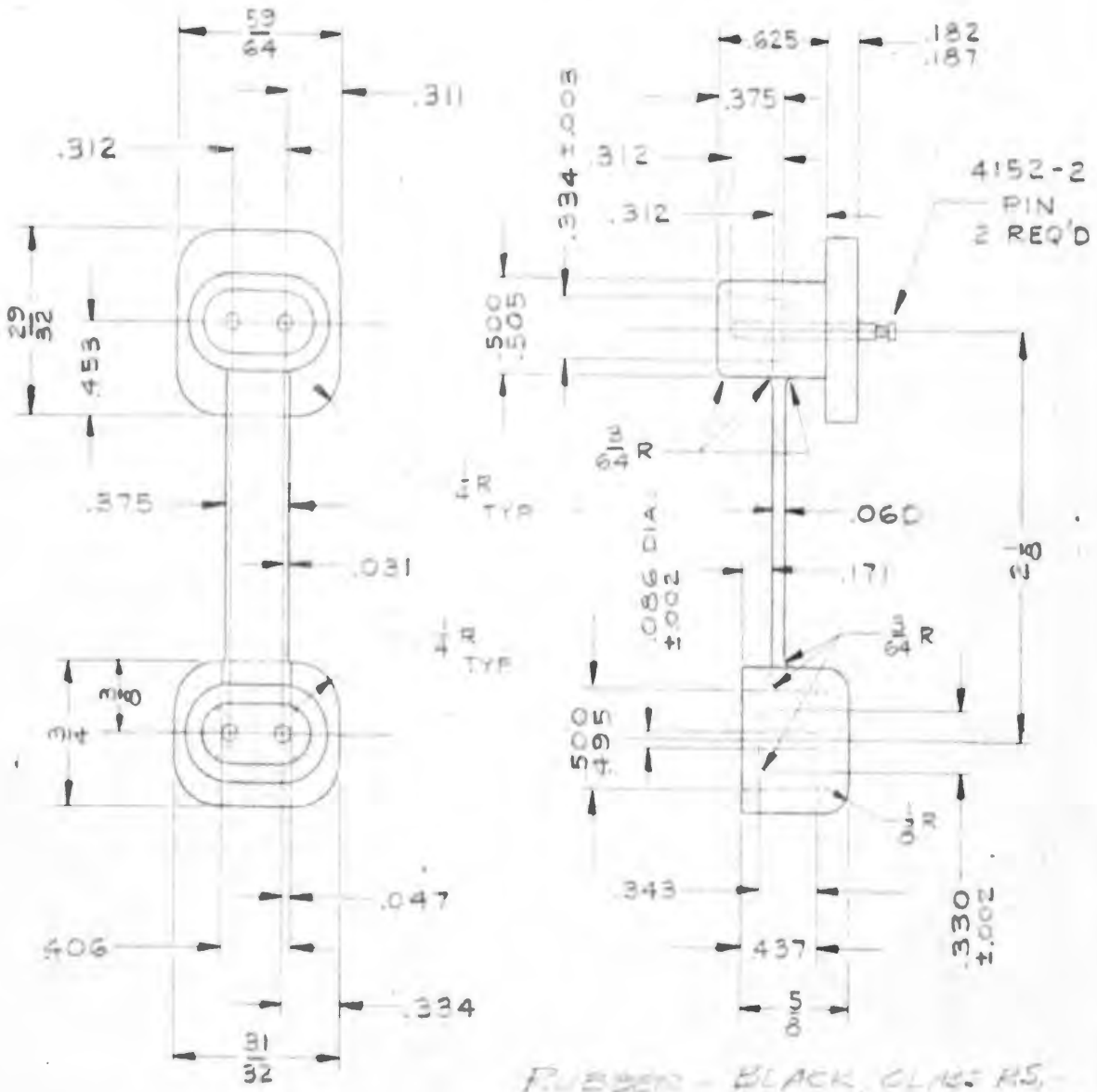
handle while holding the case in the normal position and then let the handle drop free. If there is any hesitation it should be sought out and corrected. This hesitation will reduce the output to a very large extent.

If the assembly is tightly sealed there will be a tendency on the return stroke to slow down after several quickly repeated cycles. This is due to lack of air inside the unit which tends to create a vacuum inside the silicone boot. This will happen repeatedly in the cold test.

This T49E¹ is a very sensitive assembly and requires constant surveillance on all phases, especially final assembly. The causes for reject at assembly should be tabulated and communicated to the responsible sources adding as many check points as necessary to control the quality level required for maximum production.

NOTES

1. UNLESS NOTED ALL CORNER RADII .010 MAX.
2. DRAFT ALLOWANCE NOT REQUIRED.

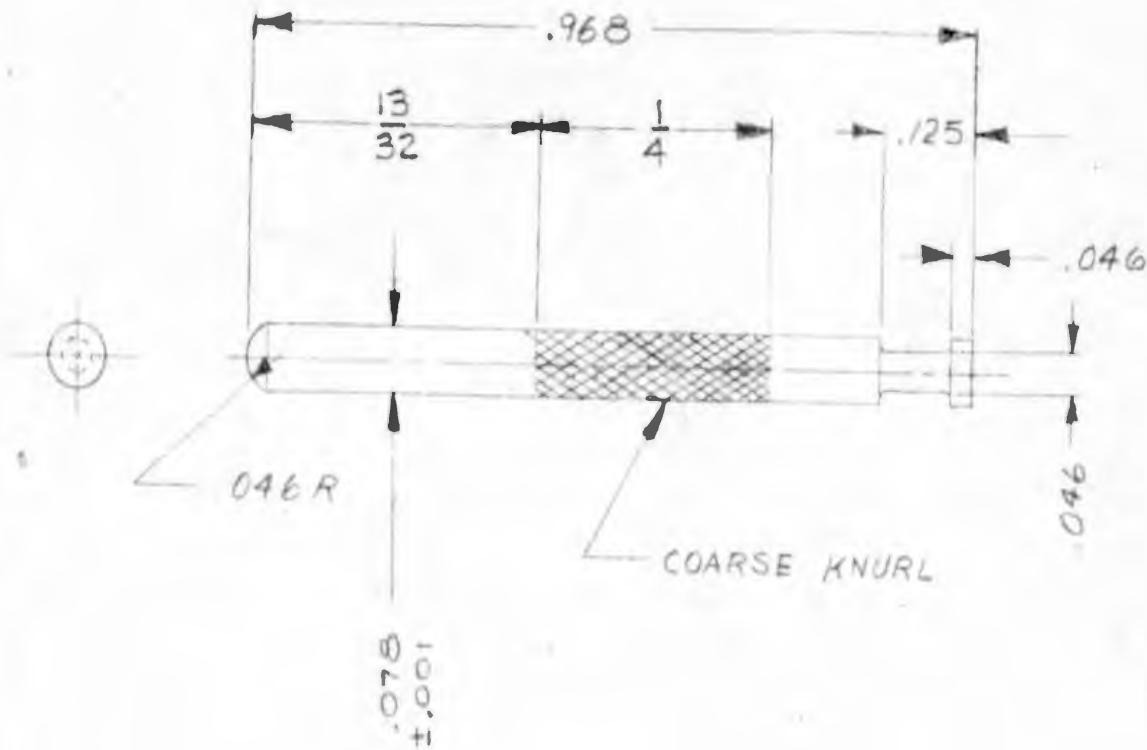


RUBBER - BLACK, CLASS RS,
GRADE 65 ABRK PER MIL-I-3065

REVIEWED	DATE	APP'D	DATE
		<i>M.L.</i>	<i>7-29-60</i>
MATERIAL:			
FINISH:			
DESIGNED FOR:		FILE:	
ALL DIMENSIONS ARE IN INCHES. LIMITS: FRACTIONS ± 1/64" DECIMALS ± .005" ANGLES ± 1/4° UNLESS OTHERWISE NOTED.			
SUPERSEDES:		SUPERSEDED BY:	
<input type="checkbox"/> CHECK WITH ENGINEERING DEPT. ON LATEST ISSUE BEFORE USING THIS PRINT. <input type="checkbox"/>			

CONNECTOR	
SCALE: FULL	DATE: 2-6-59
DRAWN: H.K.	CHECKED: <i>M.L.</i> APP'D:
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• DATE OF PRINT •	
4152-1	

CHANGES:-



REF ORD # 8845192

MATERIAL: BRASS-ASTM 271

FINISH: —

DESIGNED FOR: FILE:

ALL DIMENSIONS ARE IN INCHES.
LIMITS: FRACTIONS ± 1/64" DECIMALS ± .005"
ANGLES ± 1/4° UNLESS OTHERWISE NOTED.

SUPERSEDES: SUPERSEDED BY:

■ CHECK WITH ENGINEERING DEPT. ON LATEST ISSUE BEFORE USING THIS PRINT. ■

PRONG

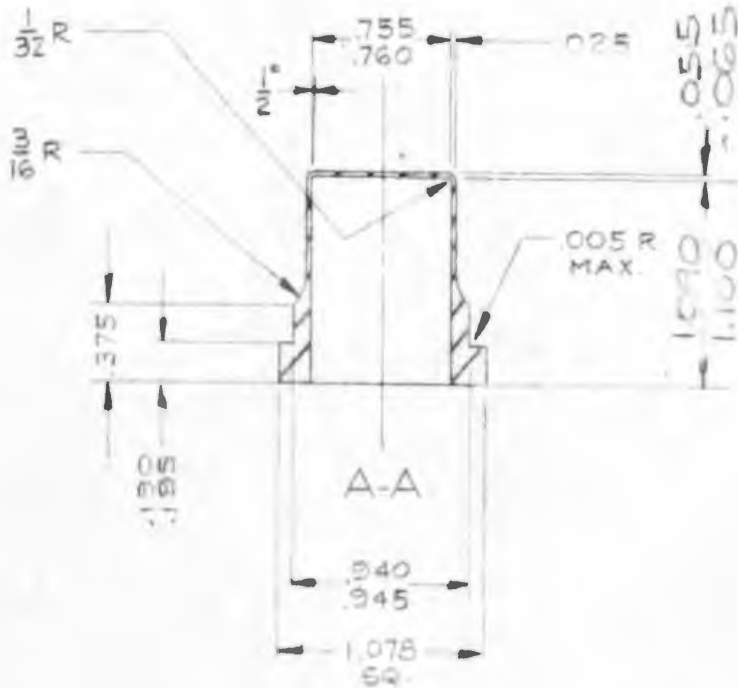
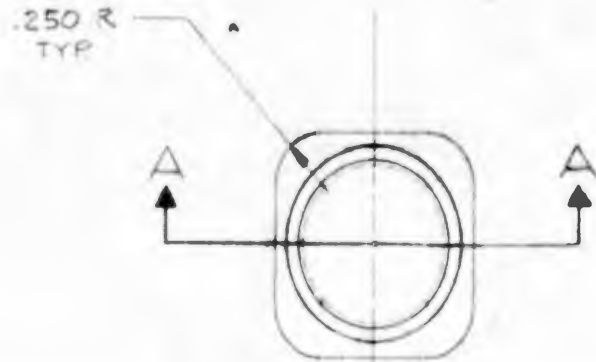
SCALE: 4" = 1" DATE: 1-23-59

DRAWN: W3 CHECKED: APP'V'D:

MOLDED INSULATION CO.
335 E. PRICE ST., PHILADELPHIA 44, PA. U. S. A.

• DATE OF PRINT • 4152-2

CHANGES:-



(B3)
 MATERIAL NOTE
 RUBBER PER MIL-R-5847 COLOR BLACK
 SIMILAR TO DOW CORNING # 651

NOTE
 UNLESS SPECIFIED DRAFT
 ALLOWANCE NOT REQUIRED

REF. ORD. # 8800927

MATERIAL: (B3) SEE NOTE	
FINISH: _____	
DESIGNED FOR:	FILE:
ALL DIMENSIONS ARE IN INCHES. LIMITS: FRACTIONS ± 1/64" DECIMALS ± .005" ANGLES ± 1/4° UNLESS OTHERWISE NOTED.	
SUPERSEDES:	SUPERSEDED BY:
<input type="checkbox"/> CHECK WITH ENGINEERING DEPT. ON LATEST ISSUE BEFORE USING THIS PRINT.	

BOOT	
SCALE: FULL	DATE: 2-10-59
DRAWN: H.K.	CHECKED: <i>[initials]</i>
MOLDED INSULATION CO. 335 E. PRICE ST., PHILADELPHIA 44, PA. U. S. A.	
• DATE OF PRINT.	4152-3

CHANGES:-
 A 1.062 DIMENL WAS 1.000
 B1 WAS 1.062
 B2 WAS .025
 B3 WAS BLACK RUBBER
 6-8-60 M.G.



NOTE:
 ASSEMBLED HEIGHT .704. UNSPECIFIED
 HEIGHT 7/8 LB. 3/4 LB. SOLID HEIGHT .535. NO. OF
 COILS (APPROX) 12.3. SEE NO FUNCTIONS IN HOLE .212+0.003
 FINISH NO. 1.1.1.3 OF MIL-STD-171(ORD)

REF Q.L # 252112

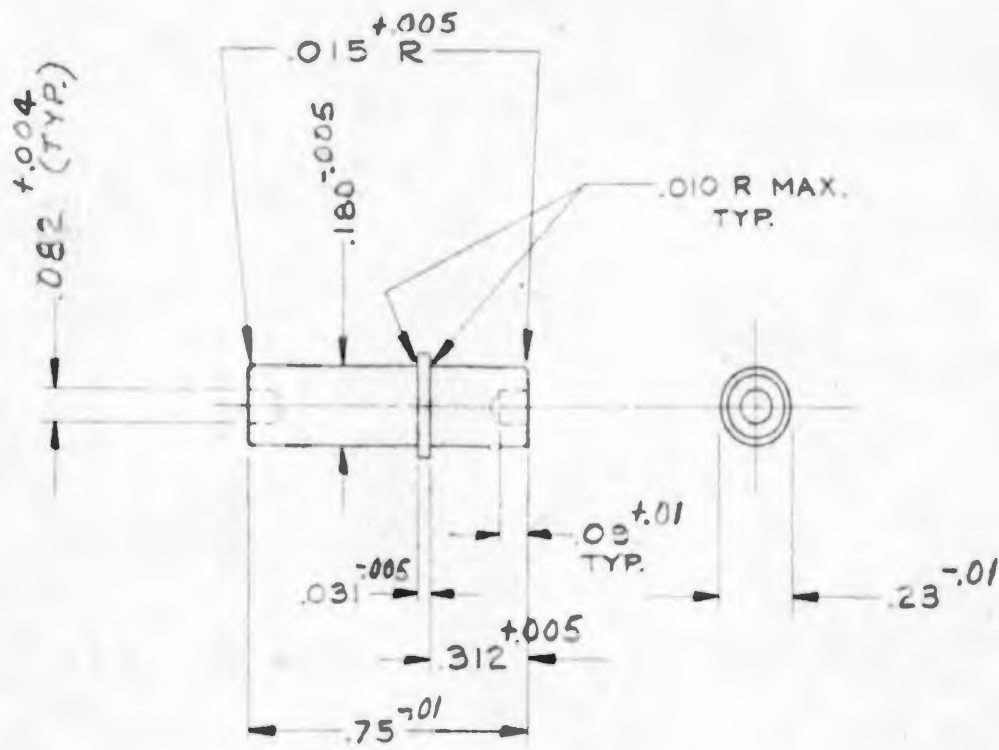
SPRING ARMATURE

MATERIAL: WIRE, MUSIC. SPEC. QQ-W-470	
FINISH: SEE NOTE	
DESIGNED FOR:	FILE
ALL DIMENSIONS ARE IN INCHES. LIMITS: FRACTIONS ± 1/64" DECIMALS ± .005" ANGLES ± 1/4° UNLESS OTHERWISE NOTED.	
SUPERSEDES:	SUPERSEDED BY:
<input type="checkbox"/> CHECK WITH ENGINEERING DEPT. ON LATEST ISSUE BEFORE USING THIS PRINT.	

SCALE: 4=1	DATE: NOV. 17, 1959
DRAWN: J.H.P.	CHECKED: J.C.
APP'V'D:	
MOLDED INSULATION CO. 335 E. PRICE ST., PHILADELPHIA 44, PA. U. S. A.	
• DATE OF PRINT •	4152-7

CHANGES:-

A
 ISSUE
 37



REF. ORD # 8800932

MATERIAL: STAINLESS STL-416

FINISH: 125 ALL OVER

DESIGNED FOR: FILE:

ALL DIMENSIONS ARE IN INCHES.
LIMITS: FRACTIONS ± 1/64" DECIMALS ± .005"
ANGLES ± 1/4° UNLESS OTHERWISE NOTED.

SUPERSEDES: SUPERSEDED BY:

CHECK WITH ENGINEERING DEPT. ON LATEST ISSUE BEFORE USING THIS PRINT.

RETAINER, BAIL

SCALE: 2/1 DATE: 2-12-59

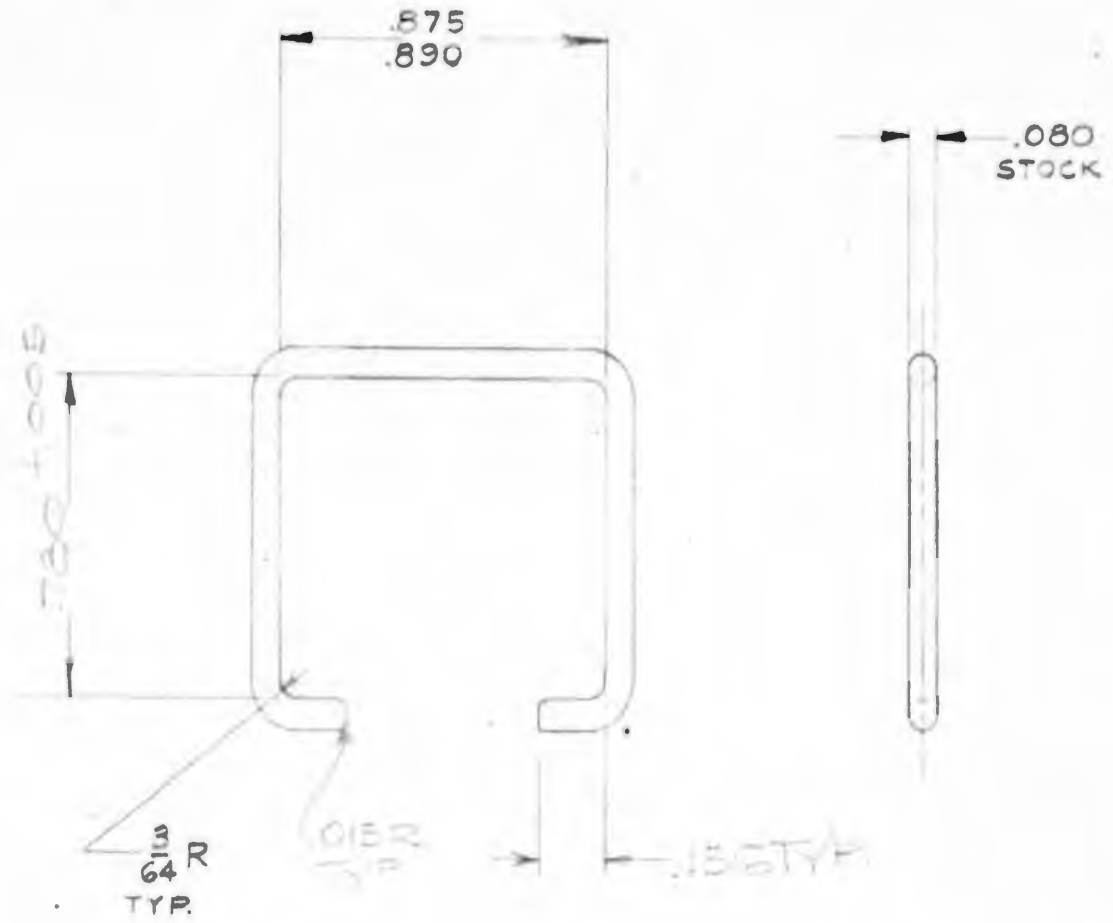
DRAWN: H.K. CHECKED: APPV'D: 7/11/59

MOLDED INSULATION CO.
335 E. PRICE ST., PHILADELPHIA 44, PA. U.S.A.

DATE OF PRINT: 4152-8

CHANGES:-

A
ISSUE



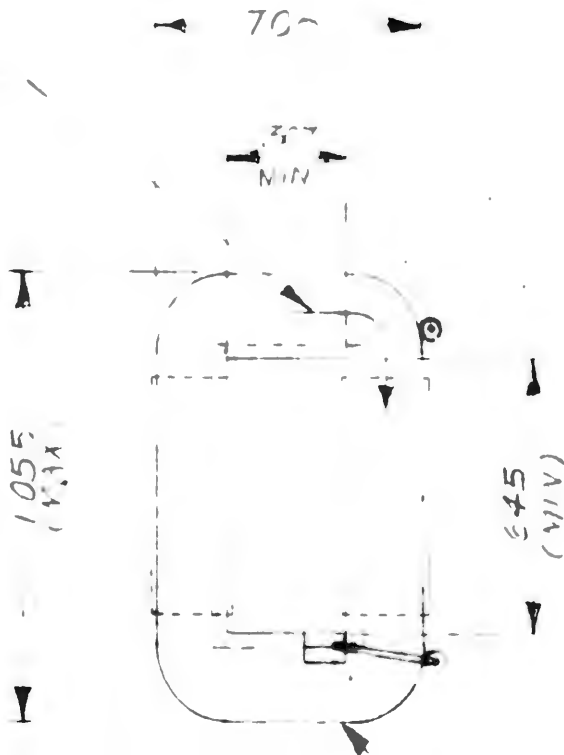
REF. ORD. # 8811933

MATERIAL: STAINLESS STEEL #412		BAIL	
FINISH:		SCALE: 2/1	DATE: 2-16-59
DESIGNED FOR:	FILE:	DRAWN: HK	CHECKED: <i>JK</i>
ALL DIMENSIONS ARE IN INCHES. LIMITS: FRACTIONS ± 1/64" DECIMALS ± .005" ANGLES ± 1/4° UNLESS OTHERWISE NOTED.		APP'V'D:	
SUPERSEDES:		MOLDED INSULATION CO.	
SUPERSEDED BY:		335 E. PRICE ST., PHILADELPHIA 44, PA. U. S. A.	
CHECK WITH ENGINEERING DEPT. ON LATEST ISSUE BEFORE USING THIS PRINT.		DATE OF PRINT:	4152-9

CHANGES: ② DESIGNED 6-1-60 H.S.

B
A
ISSUE

FINISH WITH 2
WRAPS OF STRIP-C
ENDING AT THE FOOT



3+1
4-16

1-2
4-16

SLEEVE-A

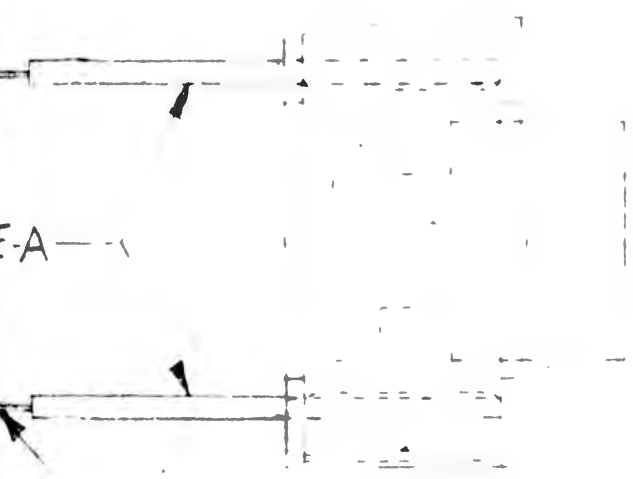
B' BIN-
A7141203

WIRE-
WIRE, COPPER, TYPE-R (FORMVAR)
AMERICAN WIRE GAGE NO. 23

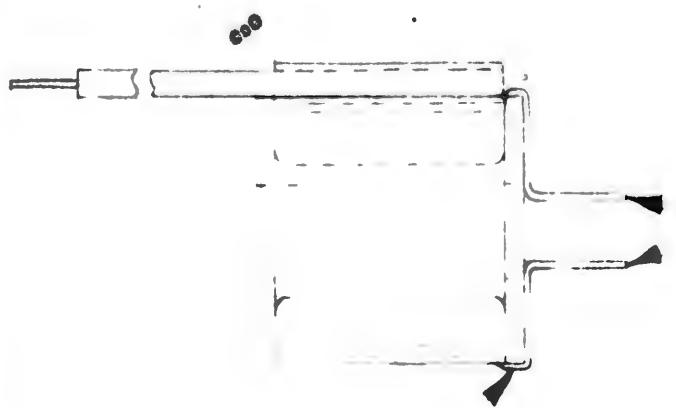


SHIMS TO BE ASSE

3+1
4-10
1 1/2 = 16



REMOVE INSULATION FROM WIRES & T.N.



2

- SHIM-A714 224

SLEEVE
SIZE

TAPER

1/2

TAPER

1/2

TO BE ASSEMBLED

SLEEVE-A
SLEEVE, GLASS FIBER, UNCOATED, CLASS CFC
R-YELLOW
SIZE 22, D. 28 APPROX.

STRIP-B
TAPE, GLASS-FIBER, UNCOATED, CLASS CFC
COLOR-WHITE
 $\frac{1}{2} \times 6\frac{3}{4} \times .007$ THICK

TAPE-D
TAPE, GLASS-FIBER, UNCOATED, CLASS CFC
COLOR-WHITE
 $\frac{1}{2} \times 2 \times .007$ THICK

SHIM-A714-224

3



B'BBIN-
A7141203

WIRE-

WIRE, COPPER, TYPE-R (FORMVAR)
AMERICAN WIRE GAGE NO. 23

TAPE-D

TAP-C

FINISH



WIRE

FINISH SECTION SHOWN FINISH TAPE

SHIMS TO BE ASSEMBLED
BETWEEN 1ST & 2ND
TAP-D-C.

NOTE-

COVER THOROUGHLY WITH MOISTURE AND FUNGUS
RESISTANT WAX EXCEPT FOR TINNED SECTION
OF LEAD WIRE AND INTERIOR OF RECTANGULAR HOLE

4

TAPE

1/2 X

TAPE

1/2 X

NEEDLE POINT A 5V
WIRE # 1 N

SHIM AT 4 224

TO BE ASSEMBLED
ON 1ST & 2ND WIRE OF
C.

WIRE DATA

WIRE	NC. 23 ANG
TOTAL TURNS	27136
TURNS PER DAY	21
LAYERS	0
WIRE LAYER	1000
LAYER W. WIRE	
TEMP COEFF	.5504MS
WIRE WEIGHT	.0416 LB

5

REF. ORD # 3300 934

MATERIAL:	
FINISH:	
DESIGNED FOR:	FILE:
ALL DIMENSIONS ARE IN INCHES. LIMITS: FRACTIONS ± 1/64" DECIMALS ± .005" ANGLES ± 1/4° UNLESS OTHERWISE NOTED.	
SUPERSEDES:	SUPERSEDED BY:
CHECK WITH ENGINEERING DEPT. ON LATEST ISSUE BEFORE USING THIS PRINT.	

STR D-1
 TAPE, GLASS-FIBER, UNCOATED, CLASS CFC
 COLOR - WHITE
 $\frac{1}{2} \times 6\frac{3}{4} \times .007$ THICK

TAPE - D
 TAPE, GLASS-FIBER, UNCOATED, CLASS CFC
 COLOR - WHITE
 $\frac{1}{2} \times 2 \times .007$ THICK

S-411-A74224

WINDING DATA
 WIRE SIZE NO. 23 AWG
 TOTAL TURNS 2501 ± 6
 TURNS PER LAYER 21
 LAYERS 0
 WINDING LAYER
 LAYER WINDING
 TEST 20°C .55 HRS
 WIRE WEIGHT .0416 LB

6

REF. ORD # 8800934

MATERIAL:		COIL ASSY		
FINISH:		SCALE:	DATE:	
DESIGNED FOR:	FILE:	DRAWN:	CHECKED:	APP'D:
ALL DIMENSIONS ARE IN INCHES. LIMITS: FRACTIONS ± 1/64" DECIMALS ± .005" ANGLES ± 1/4° UNLESS OTHERWISE NOTED.				
SUPERSEDES:		SUPERSEDED BY:		
<input type="checkbox"/> CHECK WITH ENGINEERING DEPT. ON LATEST ISSUE BEFORE USING THIS PRINT.		MOLDED INSULATION CO. 335 E. PRICE ST., PHILADELPHIA 44, PA. U. S. A.		DATE OF PRINT:
		4152-10		ISSUE

CHANGES

X0

C
—
—
D

— .230 —



— $\frac{11}{32}$ —

FREE LENGTH

NOTE

1. DIRECTION OF COILS - EITHER
2. WIRE DIAMETER - .020
3. ENDS CLOSED
4. NO. OF ACTIVE COILS - 3

CHANGES:-

R.F.F. J.H.L. 8-00975

SPRING, BAIL

MATERIAL: STAINLESS STL SPRING TEMPER

FINISH:

SCALE: 2:1

DATE: 2-17-59

DESIGNED FOR:

FILE:

DRAWN: H.K.

CHECKED: /

APP'V'D:

ALL DIMENSIONS ARE IN INCHES.
LIMITS: FRACTIONS $\pm 1/64$ " DECIMALS $\pm .005$ "
ANGLES $\pm 1/4^\circ$ UNLESS OTHERWISE NOTED.

MOLDED INSULATION CO.
335 E. PRICE ST., PHILADELPHIA 44, PA. U. S. A.

SUPERSEDES:

SUPERSEDED BY:

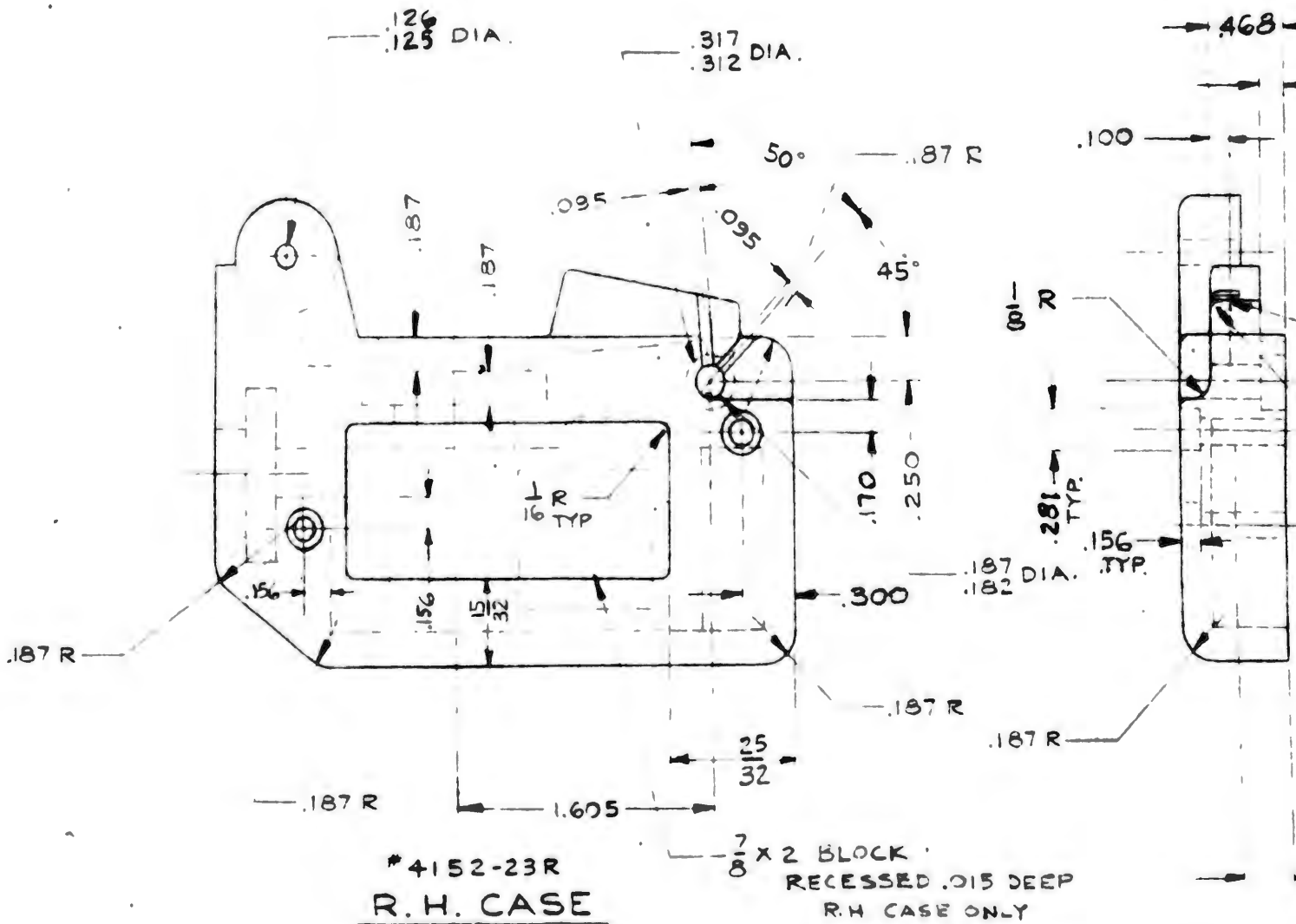
DATE OF PRINT.

4152-11

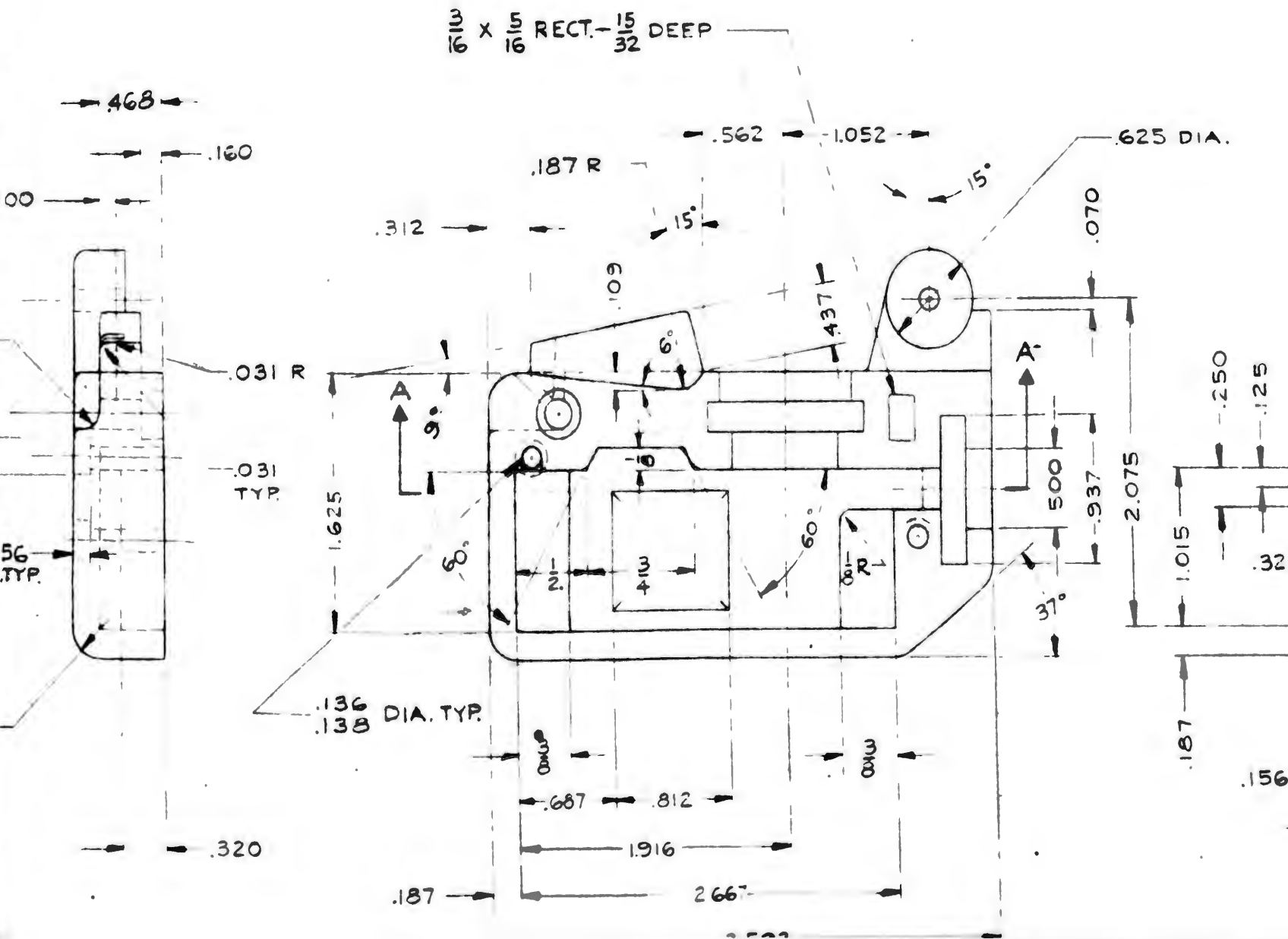
CHECK WITH ENGINEERING DEPT. ON LATEST ISSUE BEFORE USING THIS PRINT.

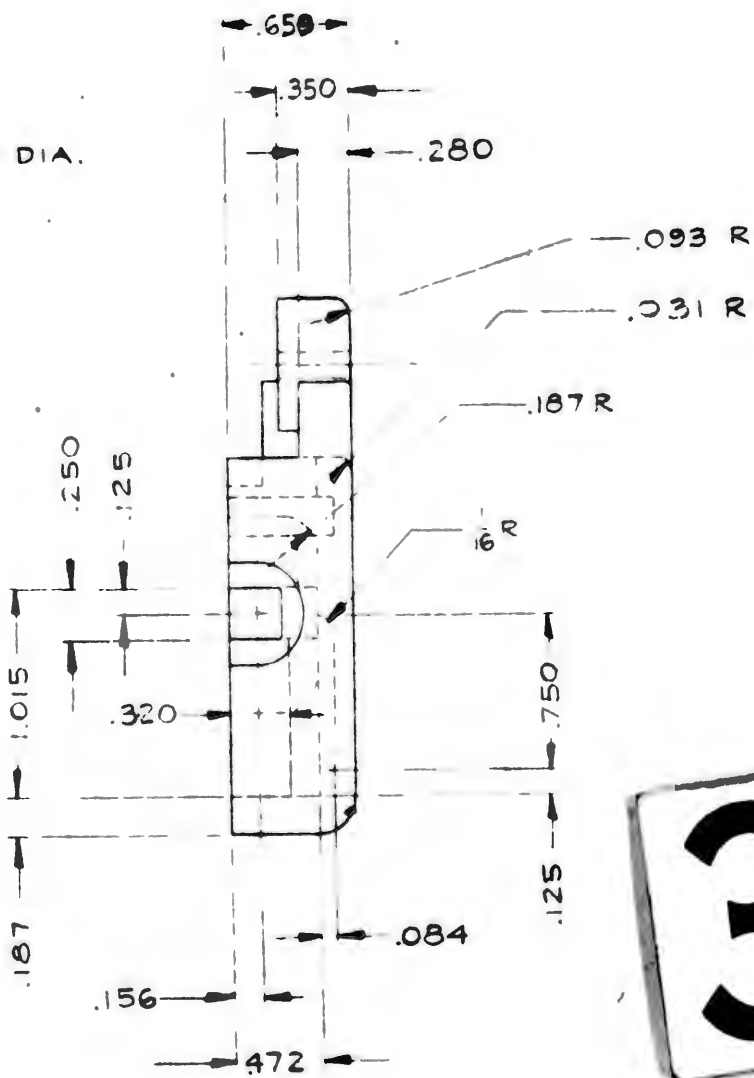
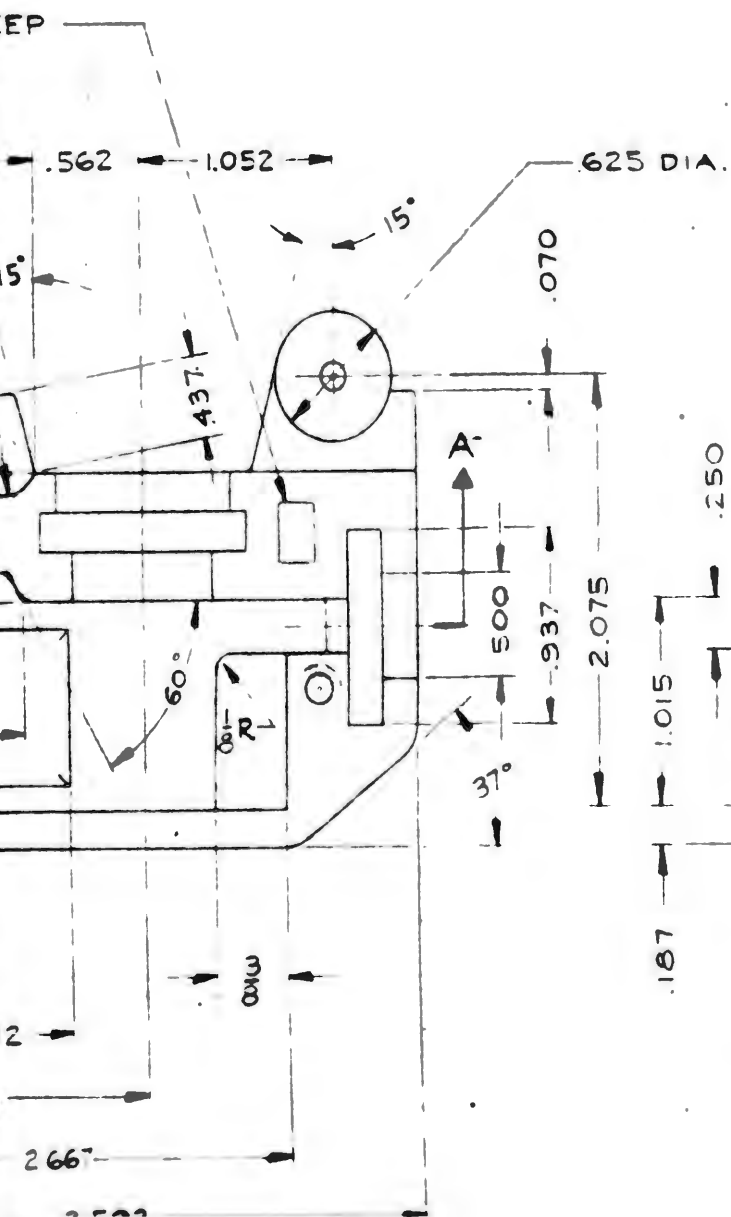
ISSUE

1

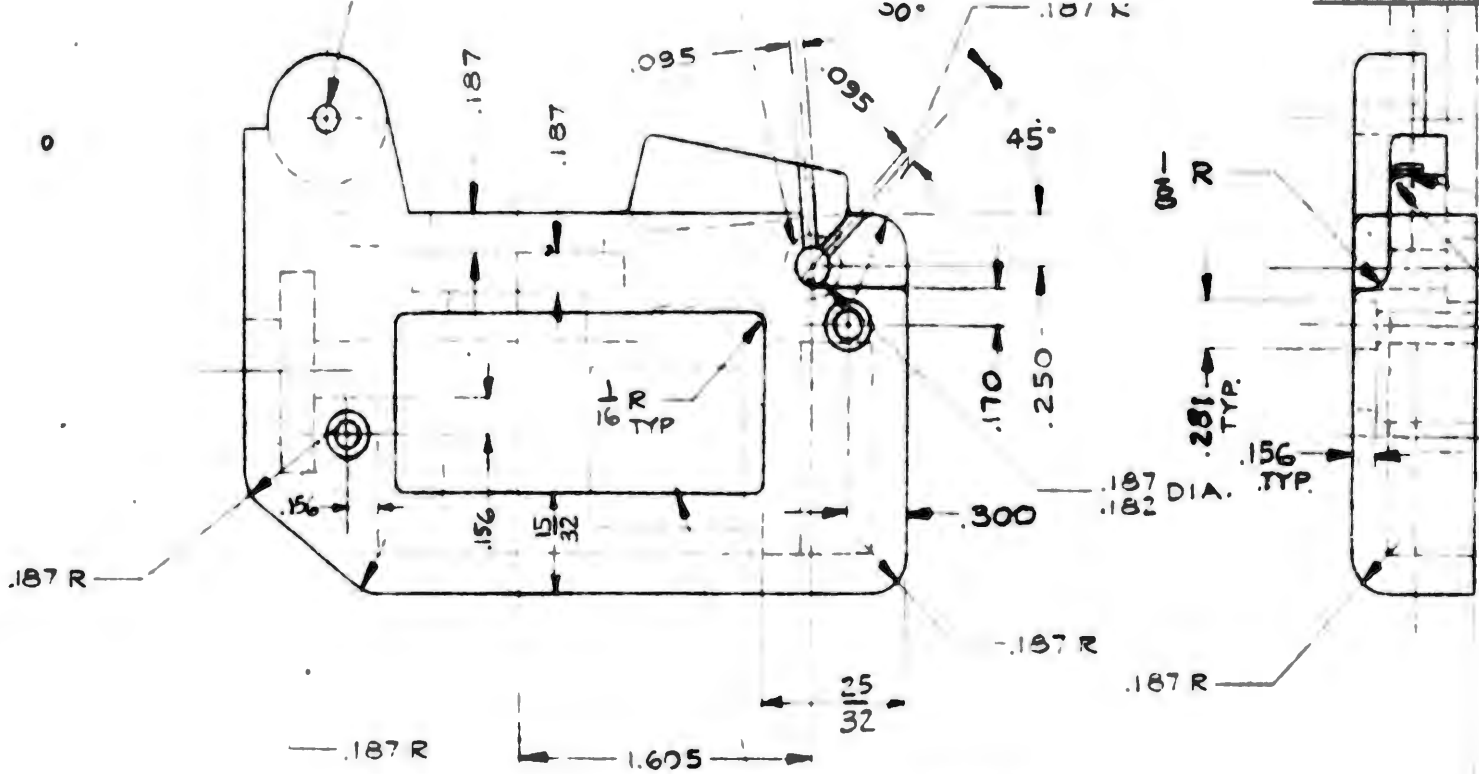


2



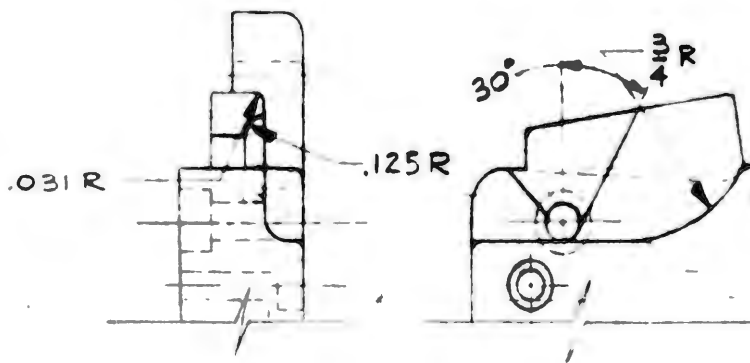


3



#4152-23R
R. H. CASE

$\frac{7}{8}$ X 2 BLOCK
 RECESSED .015 DEEP
 R.H. CASE ONLY

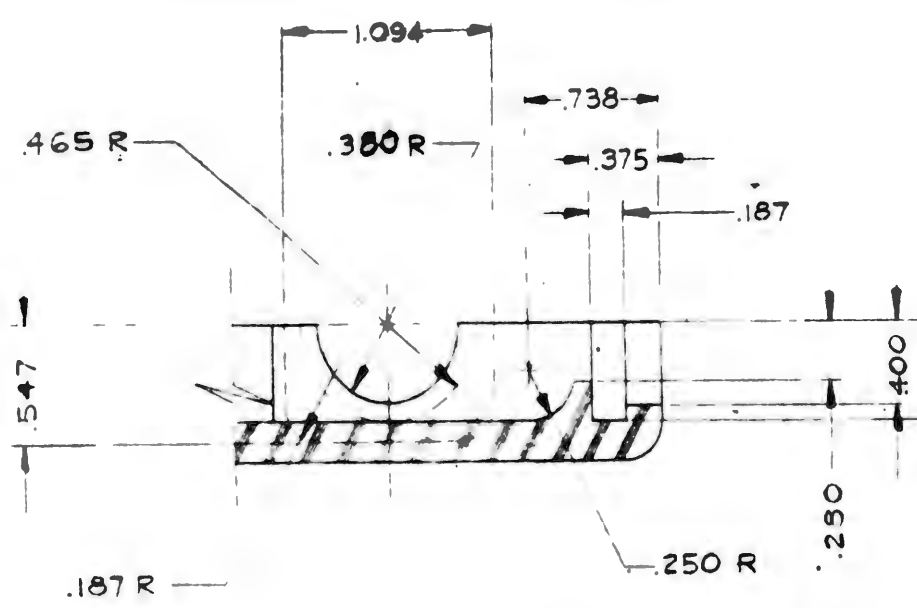
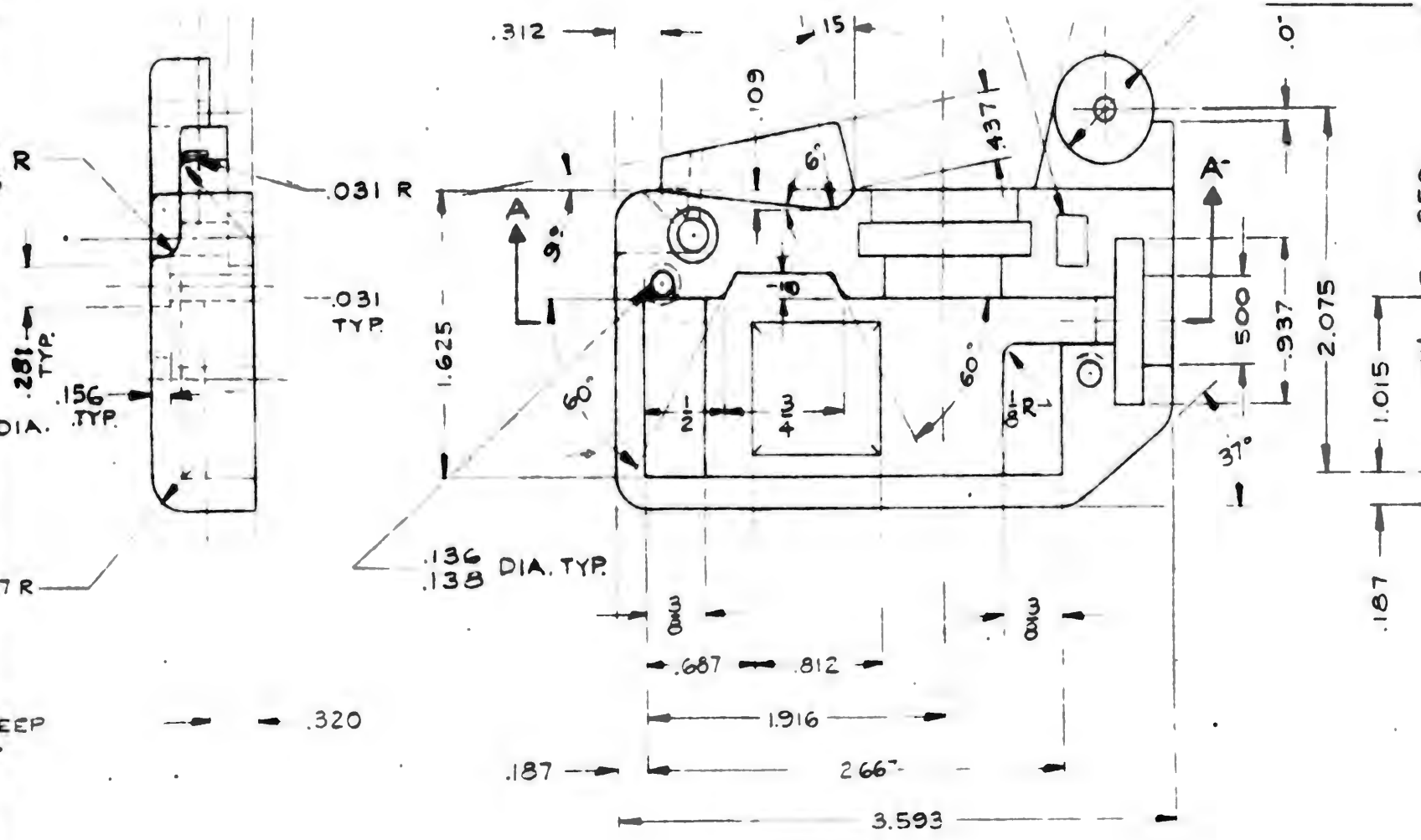


#4152-23L
L. H. CASE
 WITH EXCEPTION SHOWN

NOTE

REQD: 1-L.H. & 1-R.H. CA

4

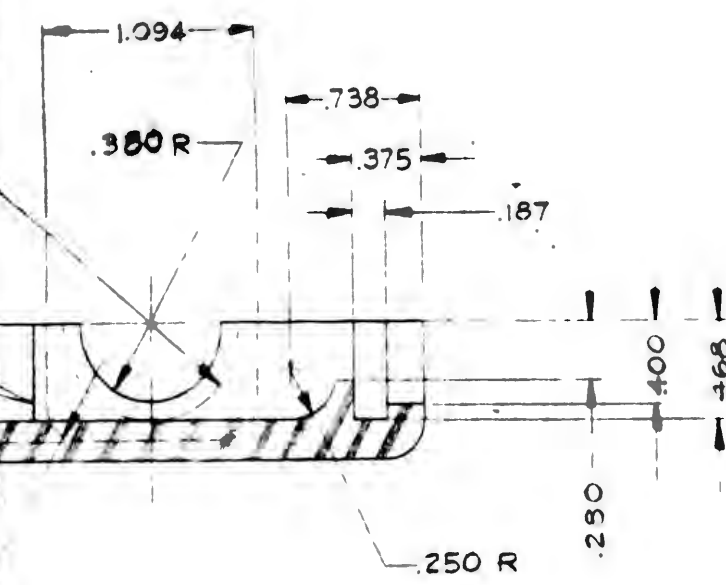
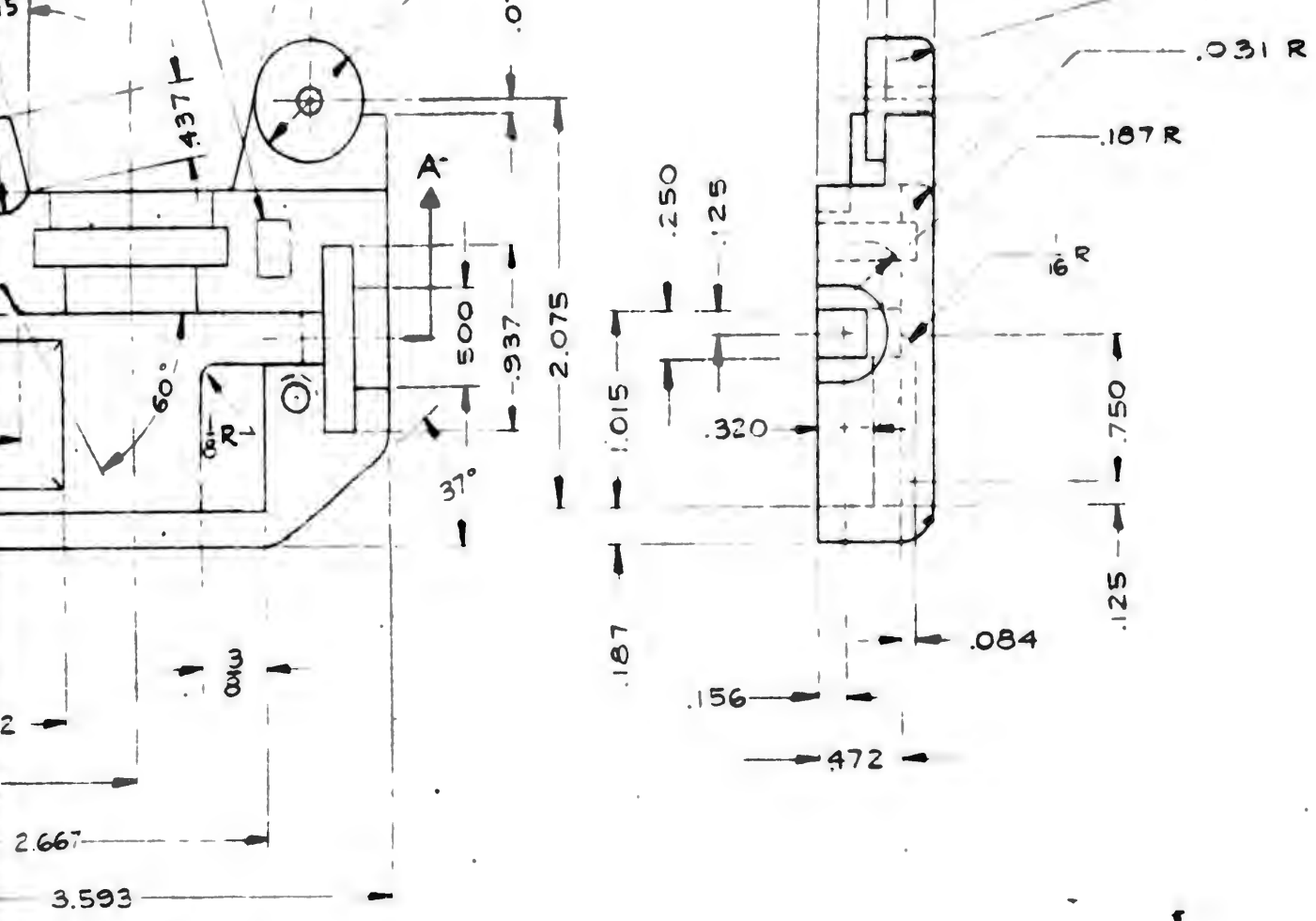


SECTION A-A

NOTE
- L.H. & 1 - R.H. CASE

5

REF: ORD # 8800947 +8	
MATERIAL: "FIBERFIL" STYRENE / M	
FINISH:	
DESIGNED FOR:	FILE
ALL DIMENSIONS ARE IN INCHES. LIMITS: FRACTIONS ± 1/64" DECIMALS ± ANGLES ± 1/4° UNLESS OTHERWISE NO	
SUPERSEDES:	SUPERSEDED B
CHECK WITH ENGINEERING DEPT. OF ISSUE BEFORE USING THIS PRINT.	



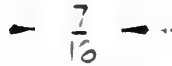
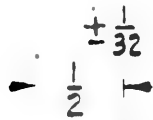
SECTION A-A

6

CHANGES: A - 1-3-58
B - 1-10-59

REF: ORD # 8800947 + 8837117		CASE	
MATERIAL: "FIBERFIL" STYRENE MIL-P-3796		SCALE: FULL	DATE: 2-12-59
FINISH:		DRAWN: H. K.	CHECKED:
DESIGNED FOR:	FILE:	APP'VD:	
ALL DIMENSIONS ARE IN INCHES. LIMITS: FRACTIONS ± 1/64" DECIMALS ± .005" ANGLES ± 1/4° UNLESS OTHERWISE NOTED.			
SUPERSEDES:		SUPERSEDED BY:	
CHECK WITH ENGINEERING DEPT. ON LATEST ISSUE BEFORE USING THIS PRINT.		MOLDED INSULATION CO. 335 E. PRICE ST., PHILADELPHIA 44, PA. U. S. A.	
		DATE OF PRINT:	4152-23

B
A
ISSUE



SPECIFICATIONS

WIRE DIAMETER - .020 - .025

DIRECTION OF COILS - EITHER

TYPE OF ENDS - SQUARED

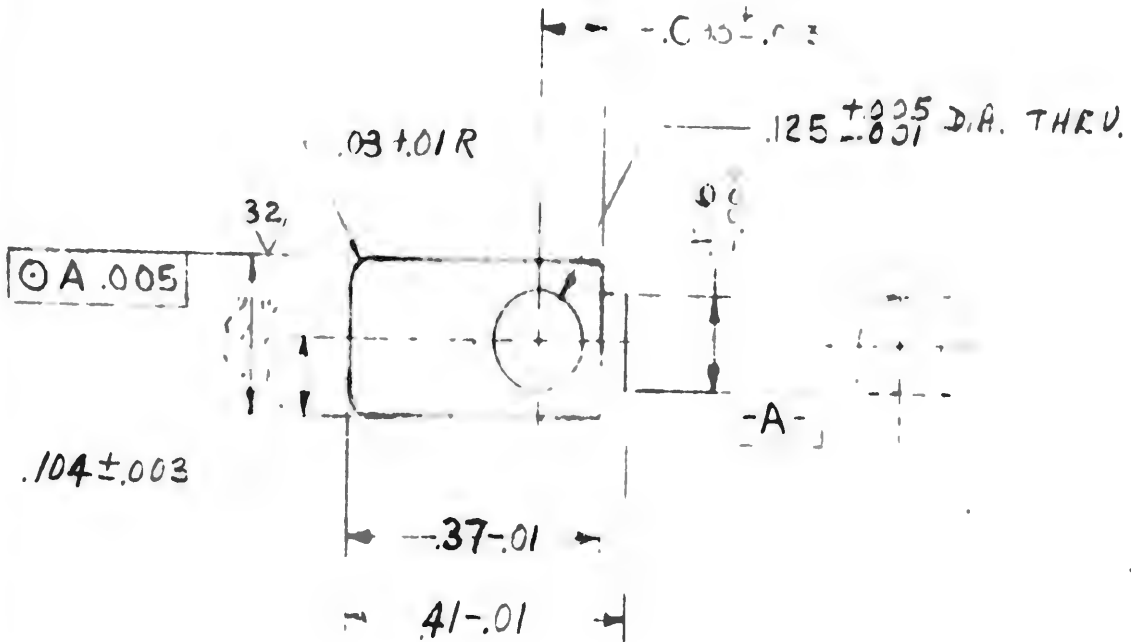
WITH ONE END CLOSED

NUMBER OF COILS - 3

Ⓢ LOAD AT 1/8 HEIGHT = 1.3 TO 1.5 LBS.

CHANGES: E-8-3-67 ADD'L - 115

REVIEWED	DATE	APP'D.	DATE	CAP SPRING	
		"	2-1-51		
MATERIAL: MUSIC WIRE				SCALE: - -	
FINISH: NONE				DATE: 9-25-53	
DESIGNED FOR:			FILE:	DRAWN: H.K.	CHECKED: <input checked="" type="checkbox"/>
ALL DIMENSIONS ARE IN INCHES. LIMITS: FRACTIONS ± 1/64" DECIMALS ± .005" ANGLES ± 1/4° UNLESS OTHERWISE NOTED.				APPV'D: <input checked="" type="checkbox"/>	
SUPERSEDES:		SUPERSEDED BY:			
CHECK WITH ENGINEERING DEPT. ON LATEST ISSUE BEFORE USING THIS PRINT.				MOLDED INSULATION CO. 335 E. PRICE ST., PHILADELPHIA 44, PA. U.S.A.	
				• DATE OF PRINT.	
				+152-24	



NOTE:

SEE NOTE # 416
 63/
 ✓ ALL DIMENSIONS ARE IN INCHES

REF. CRD. # 8800943

MATERIAL: SEE NOTE.

FINISH:

DESIGNED FOR:

FILE:

ALL DIMENSIONS ARE IN INCHES.
 LIMITS: FRACTIONS $\pm 1/64$ " DECIMALS $\pm .005$ "
 ANGLES $\pm 1/4^\circ$ UNLESS OTHERWISE NOTED.

SUPERSEDES:

SUPERSEDED BY:

CHECK WITH ENGINEERING DEPT. ON LATEST ISSUE BEFORE USING THIS PRINT.

DATE OF PRINT: 9-23-58

SCALE: 1-1

DATE: 9-23-58

DRAWN: A.C.M.

CHECKED: [Signature]

APP'D: [Signature]

MOLDED INSULATION CO.

335 E. PRICE ST., PHILADELPHIA 44, PA. U. S. A.

DATE OF PRINT:

9-23-58

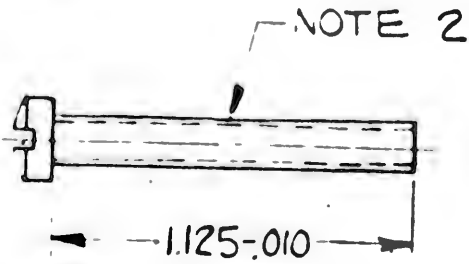
4152-25

CHANGES:

A
 ISSUE

PHYSICAL PROPERTIES		APPLICATION		A8800914			
YP		NEST ASSY	USED ON-	REVISIONS			
TS		3500024	MST	SYD	DESCRIPTION	DATE	APPROVAL
EL2				A	EOPA 6896	3-23-61	[Signature]
RA							
BM							
PM							
		DO NOT	APPLY PART NO				
		DO	AS SPECIFIED				

(A)

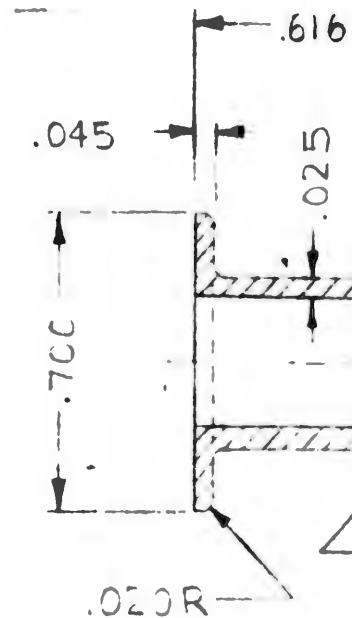
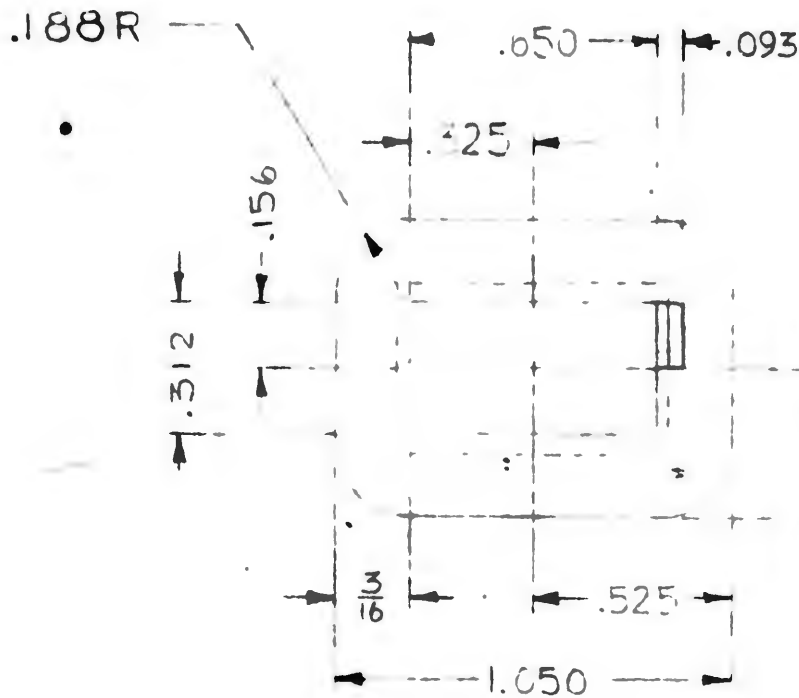


NOTES:-

- 1-SPEC MIL-G-2550 APPLIES.
- 2-MODIFY AS SHOWN FROM MS 35271-35.

ORDNANCE PART NO. 3300914

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON-	ORIGINAL DATE OF DRAWING	MAR 21 1960	P. CATINNY ARSENAL ORDNANCE CORPS DEPT OF THE ARMY DO. L. NEW JERSEY
	CRAFTSMAN	2	
	TRACER		
	ENGINEER	MC	
DECIMALS FRACTIONS ANGLES	SUBMITTED	[Signature]	SCREW, MACHINE FILLISTER HEAD
MATERIAL	APPROVED BY ORDER OF THE CHIEF OF ORDNANCE	[Signature]	
HEAT TREATMENT			DWG SIZE A
FINAL PROTECTIVE FINISH			8800914

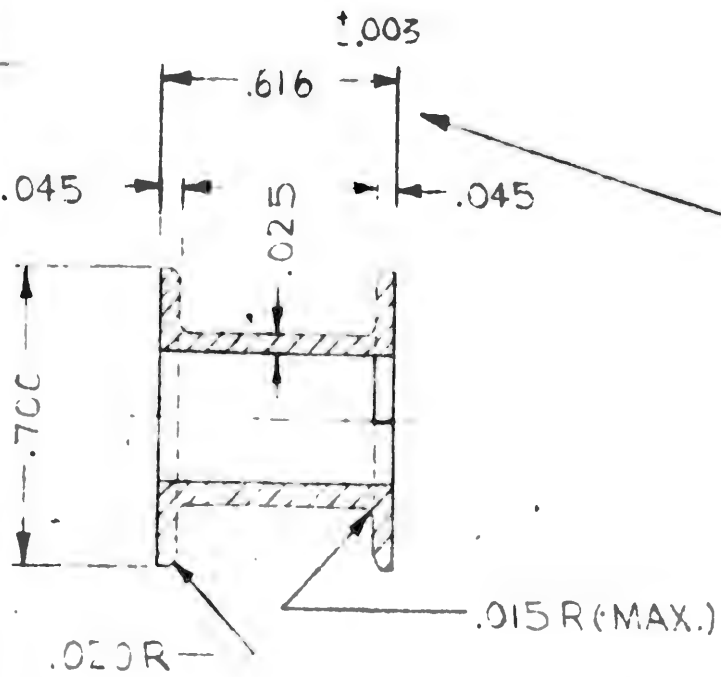


NOTE:

MATERIAL: POLYSTYRENE, TYPE II, SPEC. L-P-416.
 MATERIAL PROPERTIES:
 SOFTING POINT: 190°F MIN.
 DISTORTION UNDER HEAT: 170°F MIN.
 WATER ABSORPTION IN 24 HRS.: 2% MAX.
 BURNING RATE: SLOW.
 DIMENSIONAL EFFECT OF AGE: VERY SLIGHT.
 EFFECT ON METAL INSERT: NONE
 ROCKWELL HARDNESS: M45-M90
 COLOR: NOT MEASURANT



PHYSICAL PROPERTIES				UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		ORIGINAL OF DRAWING
YP				TOLERANCES ON DECIMALS $\pm .005$	ANGLES _____ FRACTIONS $\pm 1/64$	
TS				MATERIAL		TRACER
EL 2				HEAT TREATMENT		ENGINEER
RA						SUBMITTED
BH		NEXT ASSY	USED ON	FINAL PROTECTIVE FINISH		APPROVED CHIEF OF ORD
		APPLICATION				
RH		DO NOT	APPLY PART NO.			
		DO	AS SPECIFIED			



.006 TAPER (TOTAL OF THE .312 AND .650 DIMS. IS PERMISSIBLE IN THIS LENGTH.)

2

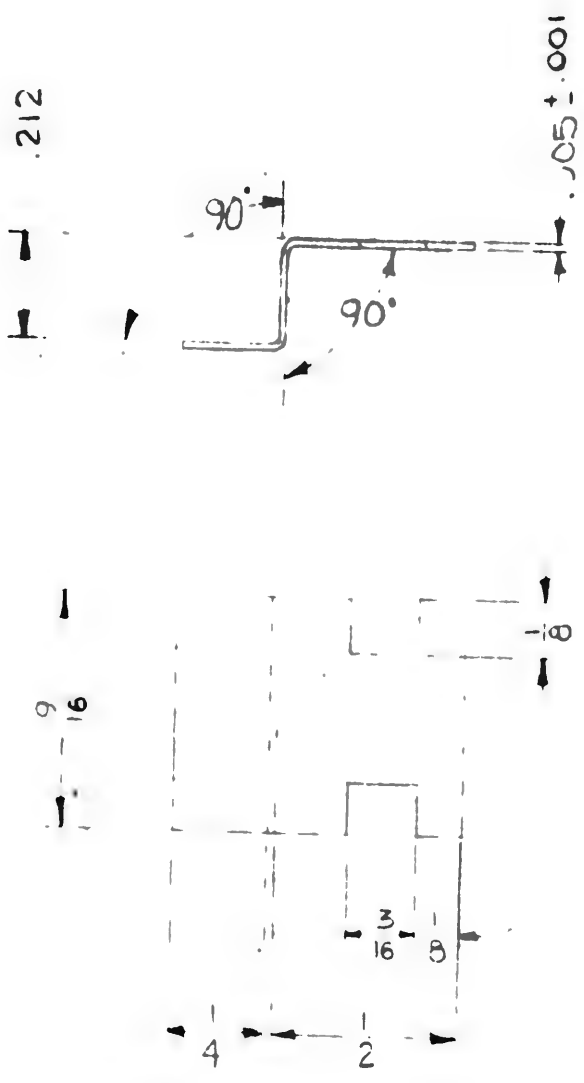
SYM	DESCRIPTION	DATE	APPROVAL
A		3-17-59	

ARE IN INCHES $\pm .005$ $\pm 1/64$	ORIGINAL DATE OF DRAWING DRAFTSMAN <i>WB</i> CHECKER TRACER CHECKER ENGINEER ENGINEER SUBMITTED APPROVED BY ORDER OF THE CHIEF OF ORDNANCE ORD CORPS
---	---

BOBBIN

SCALE 2/1 UNIT WT

ORDNANCE CORPS DEPT OF THE ARMY	
DWG SIZE B	380 329
SHEET 1 OF 1	



1

ALL RADII = .010 MAX

PHYSICAL PROPERTIES				UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ± .005 ANGLES ± 1° FRACTIONS ± 1/64	ORIGINAL DATE OF DRAWING
YP					DRAFTSMAN W3
TS				MATERIAL BRASS, COMP 1, HARD. SPEC. QQ-B-613	TRACER
EL 2				HEAT TREATMENT	ENGINEER
RA					SUBMITTED
BH		NEXT ASSY	USED ON		
		APPLICATION			
RH		DO NOT	APPLY PART NO.	FINAL PROTECTIVE FINISH	
		DO	AS SPECIFIED		APPROVED BY CHIEF OF ORDNANCE

2

MAX

SYM	DESCRIPTION	DATE	APPROVAL

SIZE IN INCHES .005 1/64	ORIGINAL DATE OF DRAWING 1-19-59
DRAFTSMAN W3	CHECKER
TRACER	CHECKER
ENGINEER	ENGINEER
SUBMITTED	
ORD CORPS	
APPROVED BY ORDER OF THE CHIEF OF ORDNANCE	
ORD CORPS	

SHIM

SCALE 2/1 UNIT WT

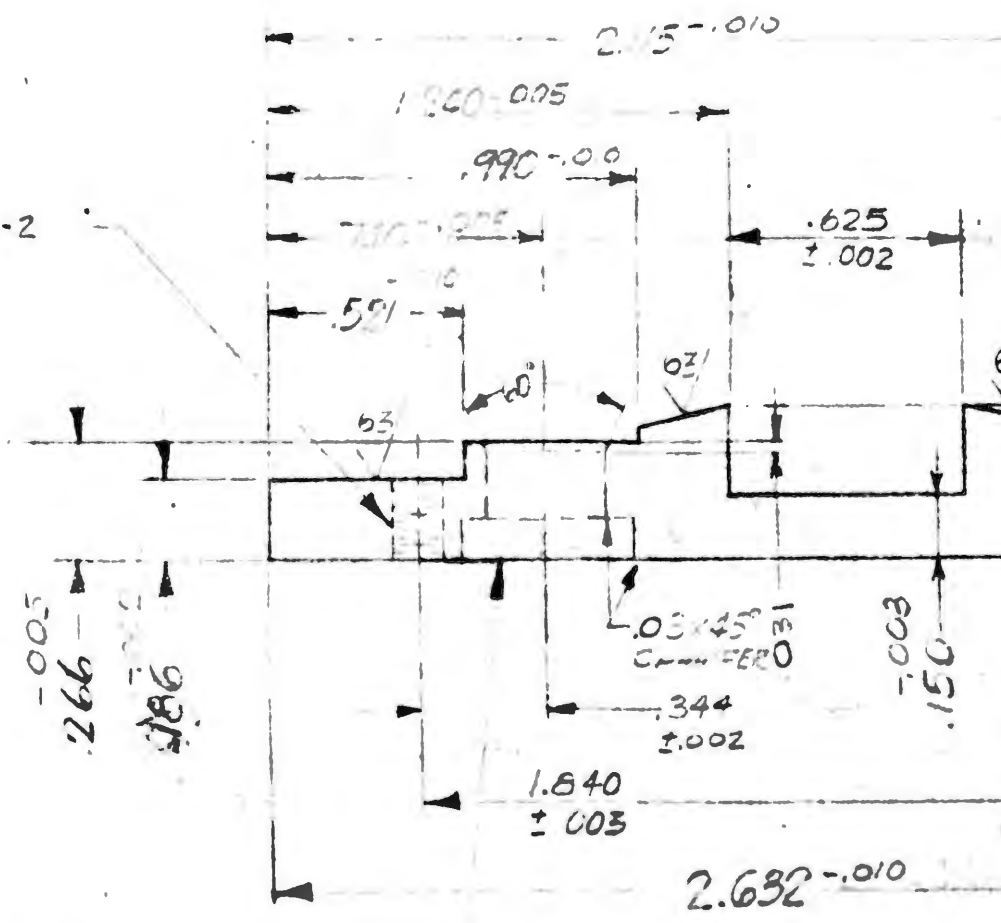
ORDNANCE CORPS
DEPT OF THE ARMY

DWG SIZE B	8800930
SHEET	OF



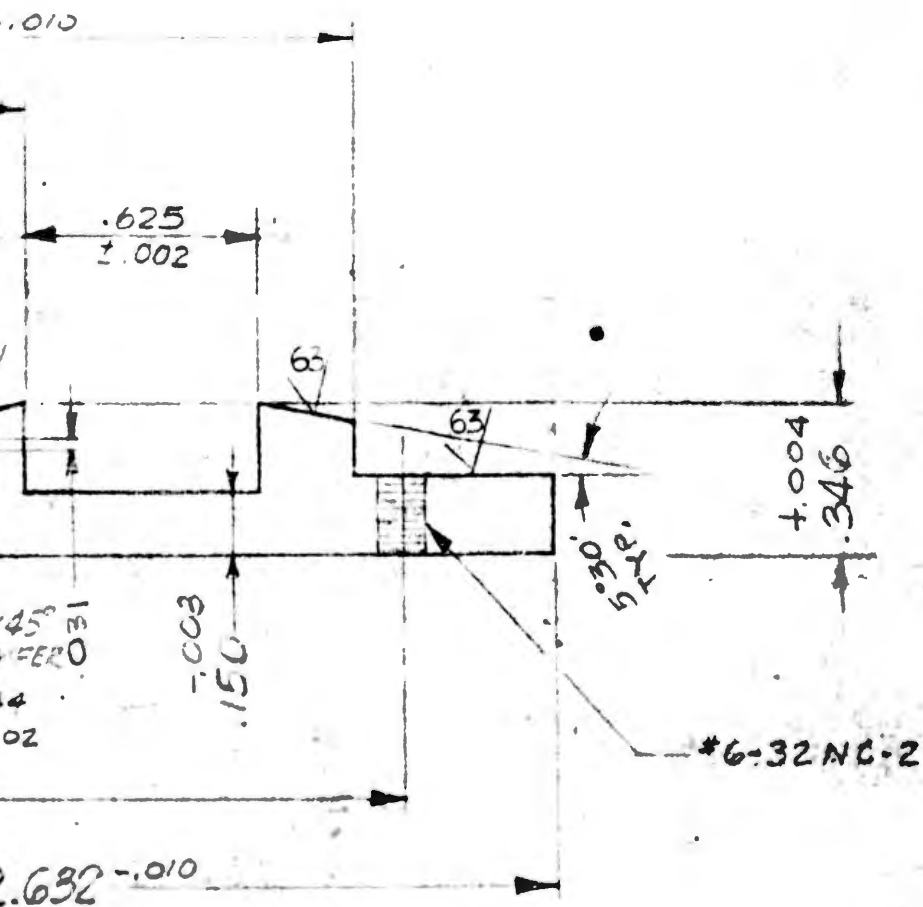
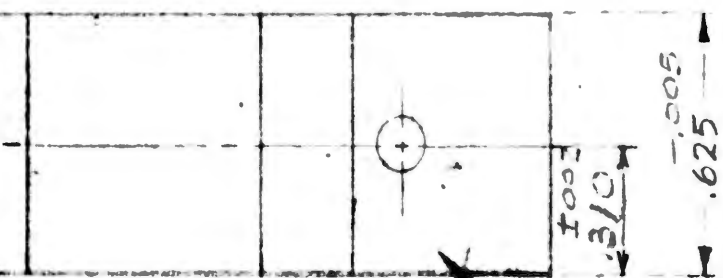
THESE SURFACES FLAT &
PARALLEL WITHIN .001

#6-32NC-2



1

.359 ± .003 DIA.



2

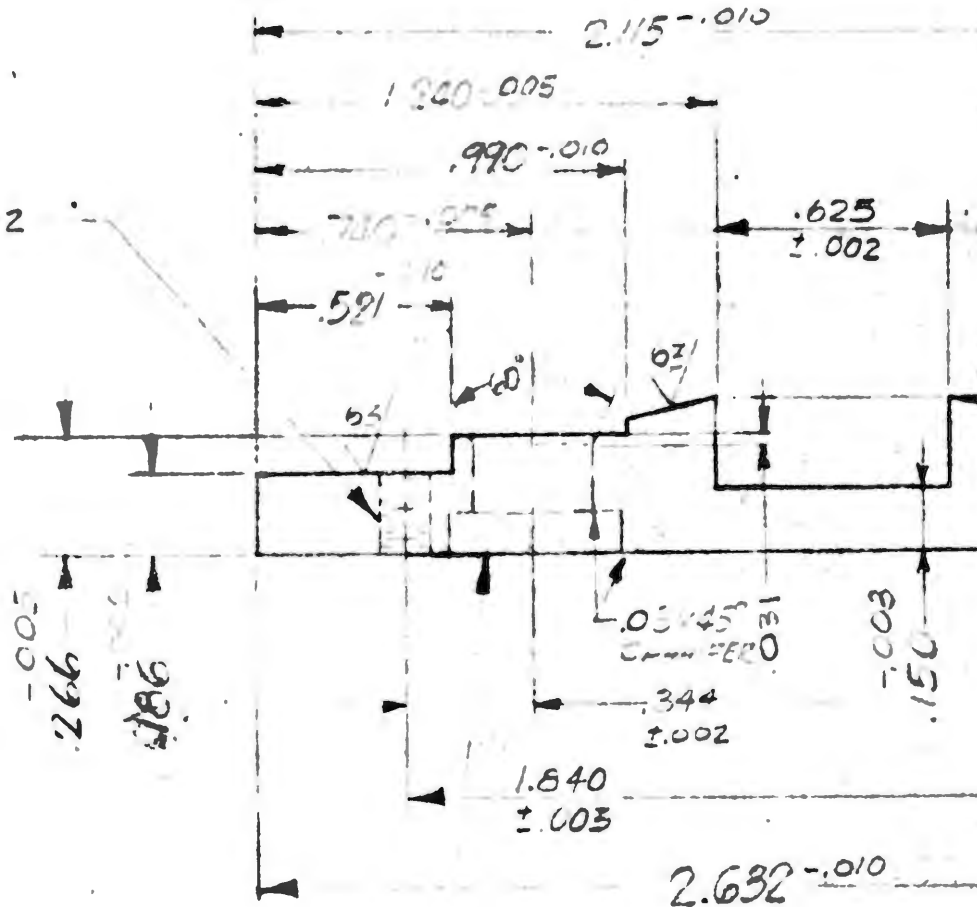
+0.004
-0.346

32NC-2

3

C

#6-32NC-2



.359 \pm .005 DIA.

.531 \pm .010 DIA. C'BORE X .093

NOTE:

125/ ALL OVER EXCEPT AS NOTED.

AFTER MACHINING AND HEAT TREATING SURFACES MARKED 'A' FLAT AND IN SAME PLANE WITHIN .001 ANGLES ARE REFERENCED TO THESE SURFACES.

CAUTION: PLATE WILL WARP WHEN MACHINED. WARP MUST BE E BEFORE FINAL MACHINING AND ALSO DURING HEAT TREAT CYCLE ANNEAL FROM 1400°F - 1420°F PARTS MAY BE QUENCH AFTER COOLING TO 400°F. TO FACILITATE REMOVAL OF

4

PHYSICAL PROPERTIES			
YP			
TS			
EL 2			
RA			
BH		NEXT ASSY	USED ON
RH		APPLICATION	
		DO NOT	APPLY PART
		DO	AS SPECIFIED

+ .004
+ .346

6

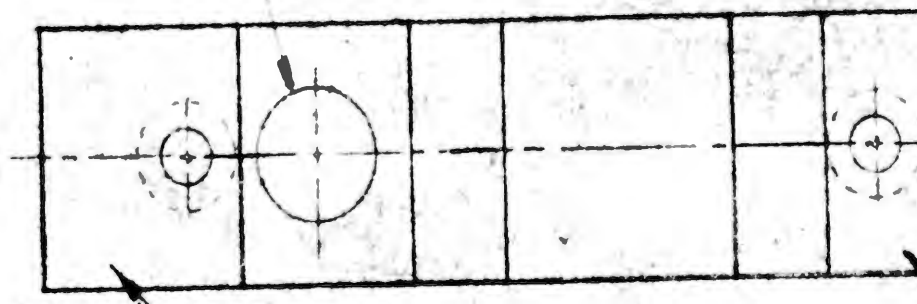
32 NC-2

SYM	DESCRIPTION	DATE	APPROVAL
A	RE-DIMENSIONED	5-18-60	LABETT

INCHES .005 1/64 C, CL 1, (D)	ORIGINAL DATE OF DRAWING 1-21-59	PLATE, TOP	ORDNANCE CORPS DEPT OF THE ARMY 4152-14		
	DRAFTSMAN WS TRACER ENGINEER		CHECKER HK CHECKER ENGINEER	DWG SIZE C	8800938
	SUBMITTED ORD CORPS		SHEET 1 OF 1		
	APPROVED BY ORDER OF THE CHIEF OF ORDNANCE ORD CORPS		SCALE 2/1	UNIT WT	

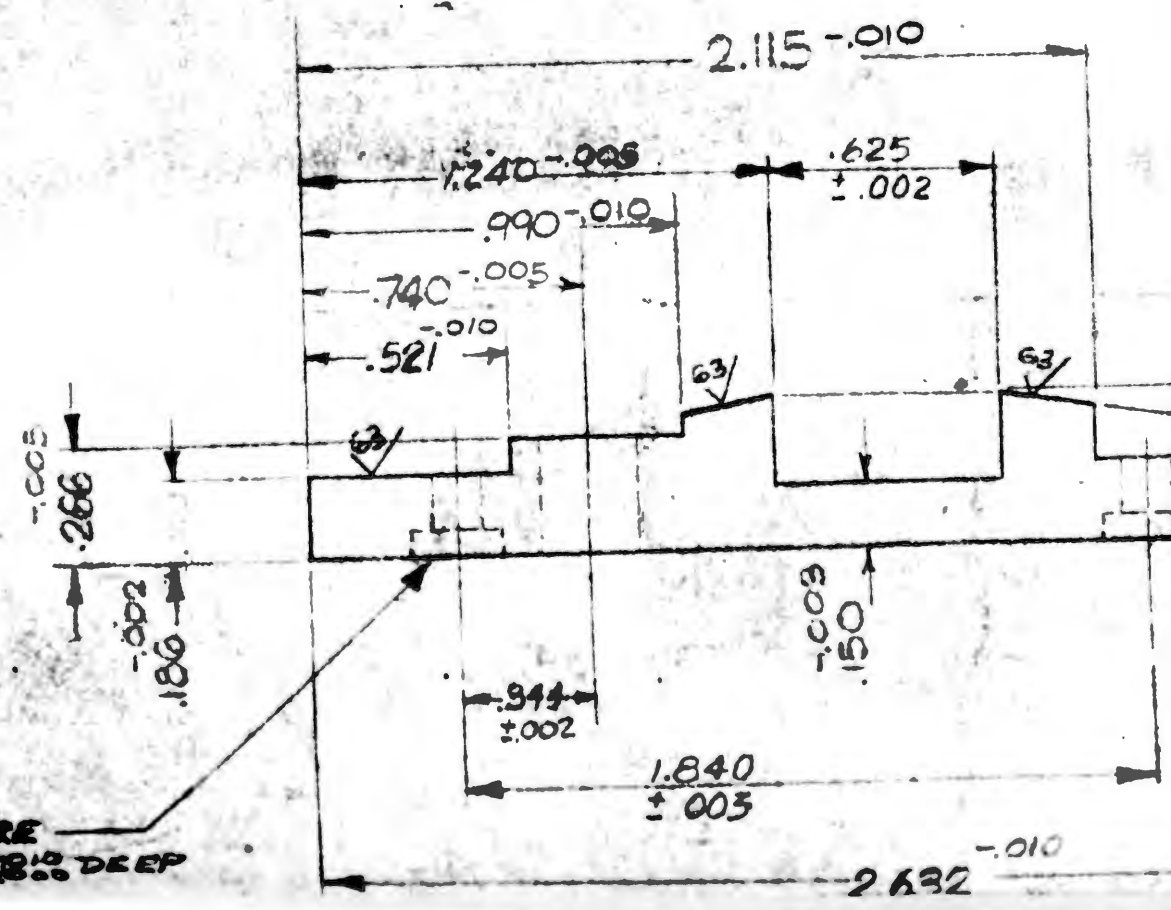
REVISION A '48

.312^{+0.005}_{-.000} DIA.

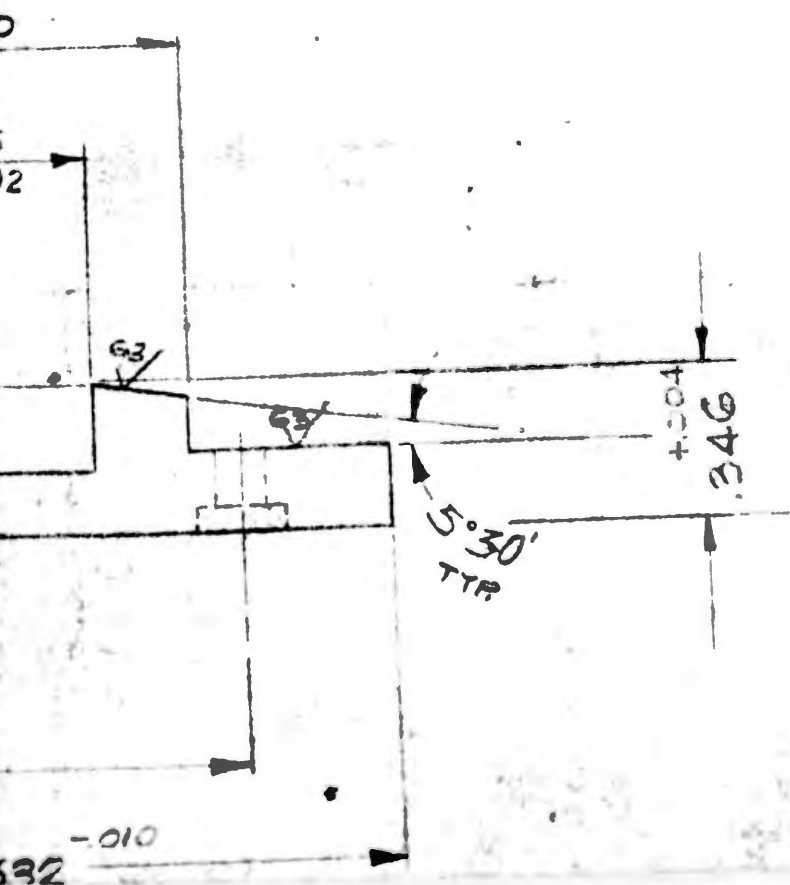
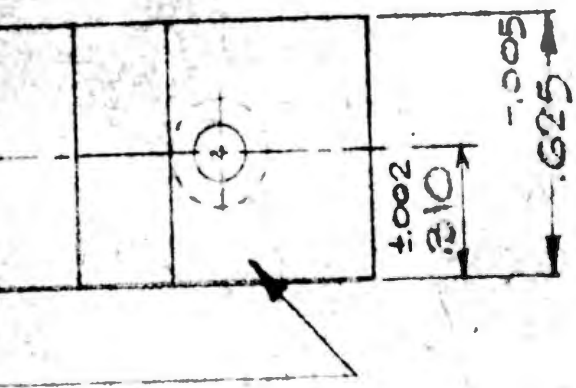


THESE SURFACES FLAT & PARALLEL WITHIN .001

1



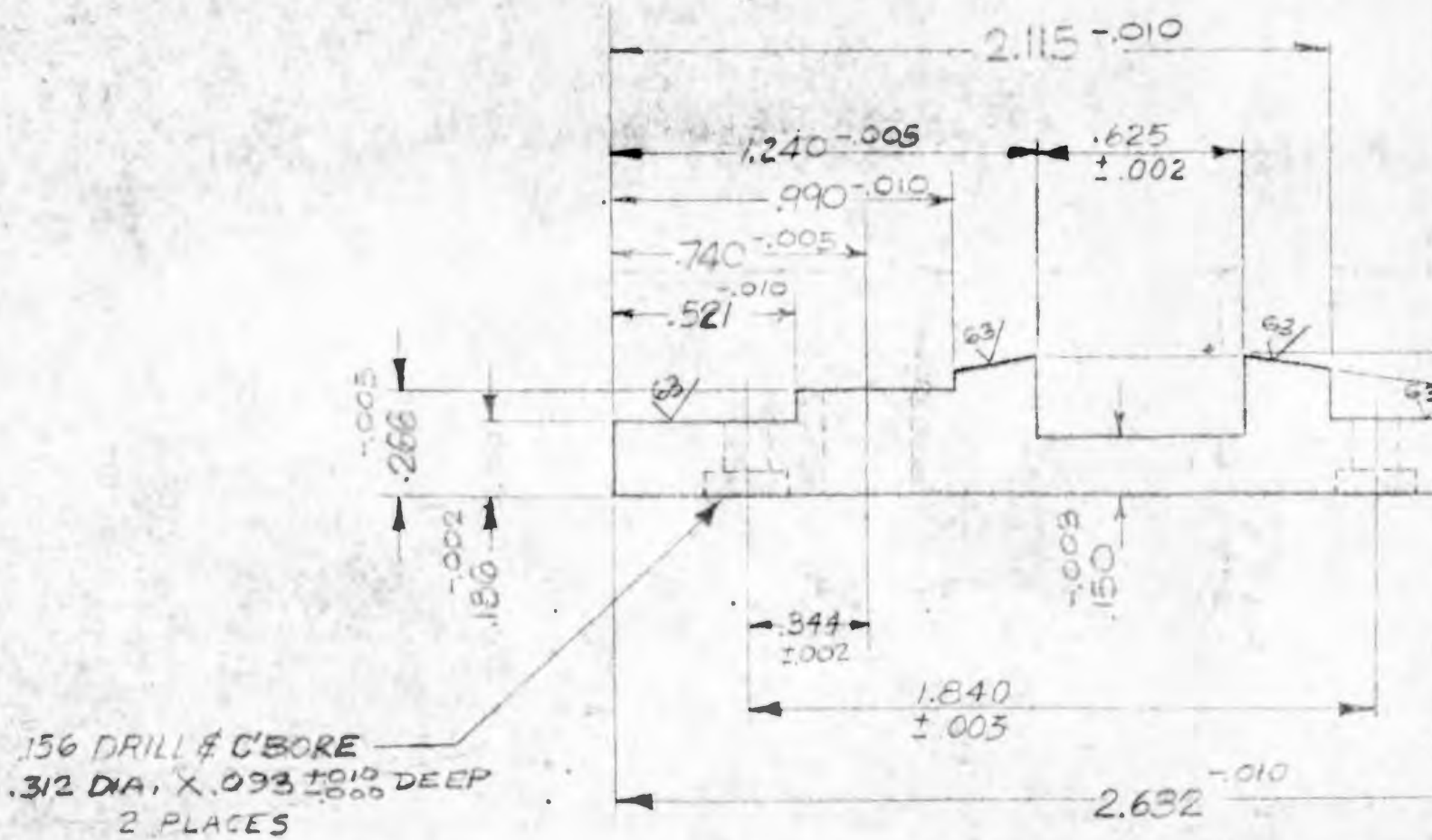
.156 DRILL & CORE
3/4 DIA. X .095 DEEP



2

3

THESE SURFACES FLAT &
PARALLEL WITHIN .001

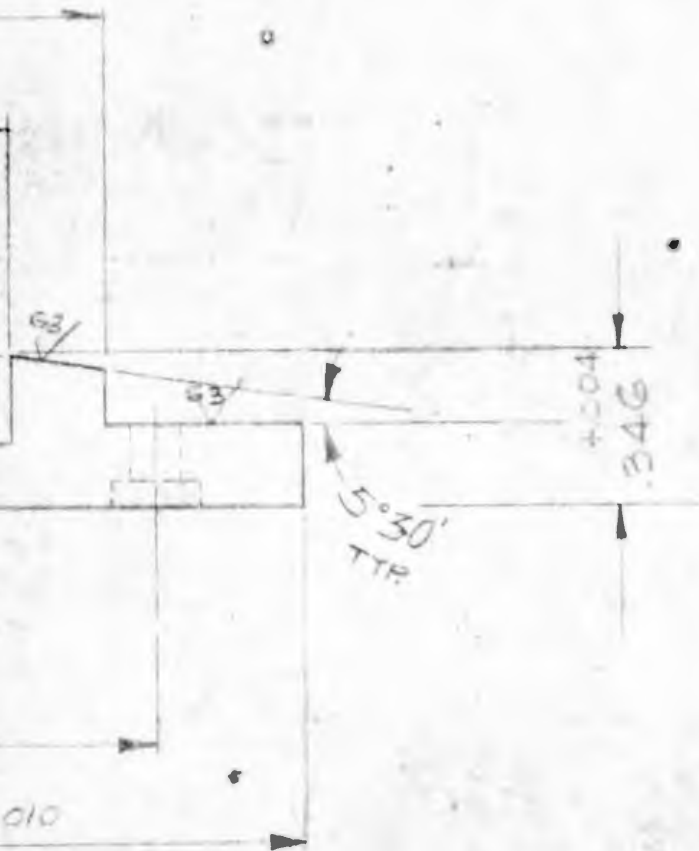


NOTE :-

1. $\sqrt{.125}$ ALL OVER EXCEPT AS NOTED.
2. AFTER MACHINING AND HEAT TREATING, SURFACES MARKED "A" MUST BE AND IN SAME PLANE WITHIN .001. ANGLES ARE REFERENCED TO THE
3. CAUTION: PLATE WILL WARP WHEN MACHINED. WARP MUST BE ELIMINATED BEFORE FINAL MACHINING AND ALSO DURING HEAT TREATING
4. CYCLE ANNEAL FROM 1400°F - 1420°F. PARTS MAY BE QUENCHED AFTER COOLING TO 400°F. TO FACILITATE REMOVAL OF THE S
5. DEBURR.

4

PHYSICAL PROPERTIES			
YP			
TS			
EL 2			
RA			
BH		NEXT ASSY	USED ON
RH		APPLICATION	
		DO NOT	APPLY PART M
		DO	AS SPECIFIED



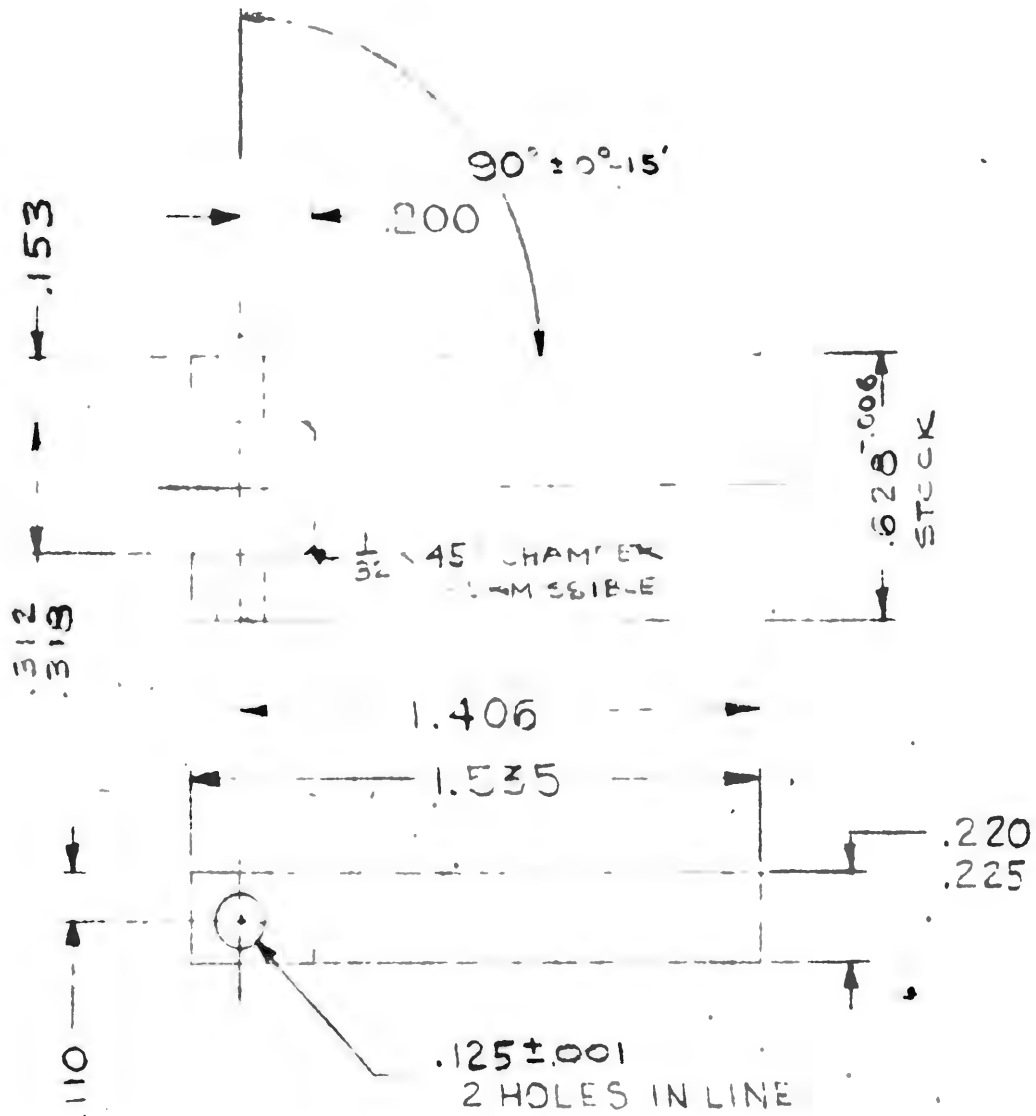
MARKED "A" MUST BE FLAT
 REFERENCED TO THESE SURFACES.
 MUST BE ELIMINATED
 AT TREATING
 BE QUENCHED IN WATER
 AL OF THE SALT

5

A	RE-DIMEN
SYM	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TOLERANCES ON DECIMALS $\pm .005$	ORIGINAL DATE OF DRAWING 1-22-59	PLATE BOTTOM
	ANGLES $\pm .005$ FRACTIONS $\pm 1/64$	DRAFTSMAN <i>WJ</i> CHECKER <i>HR</i>	
MATERIAL IRON, MAGNETIC, CL1, SPEC MIL-1-11695 (ORD)	TRACER CHECKER <i>HR</i>	ENGINEER ENGINEER	
HEAT TREATMENT SEE NOTE	SUBMITTED		
USED ON	ORD CORPS		
APPLY PART NO. AS SPECIFIED	FINAL PROTECTIVE FINISH NO. 1, 1.1, 1.3 OF MIL-STD-171(ORD)	APPROVED BY ORDER OF THE CHIEF OF ORDNANCE	
		ORD CORPS	SCALE 2/1 UNIT WT

1



NOTE :

1. IRON, MAGNETIC, CLASS 2, SPEC MIL-I-11695
2. FINISH ALL OVER 125
3. FINISH NO. 1.1.1.3 OF MIL-STD-171 (ORF)
4. HEAT TREAT - 1600°F - 24 HOURS. (BEFORE FINAL)
5. FURNACE COOL - 16 TO 24 HOURS. (MACHINING)
6. DEBURK

PHYSICAL PROPERTIES				UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		ORIG
YP				TOLERANCES ON DECIMALS ± .005		OF D
TS				ANGLES _____ FRACTIONS _____		DRAFTS
EL 2				MATERIAL SEE NOTE		TRACER
RA				HEAT TREATMENT SEE NOTE		ENGINE
BH		NEXT ASSY	USED ON			SUBM
		APPLICATION				
RH		DO NOT	APPLY PART NO.	FINAL PROTECTIVE FINISH SEE NOTE		APPR
		DO	AS SPECIFIED			CHIEF

.020
STOCK

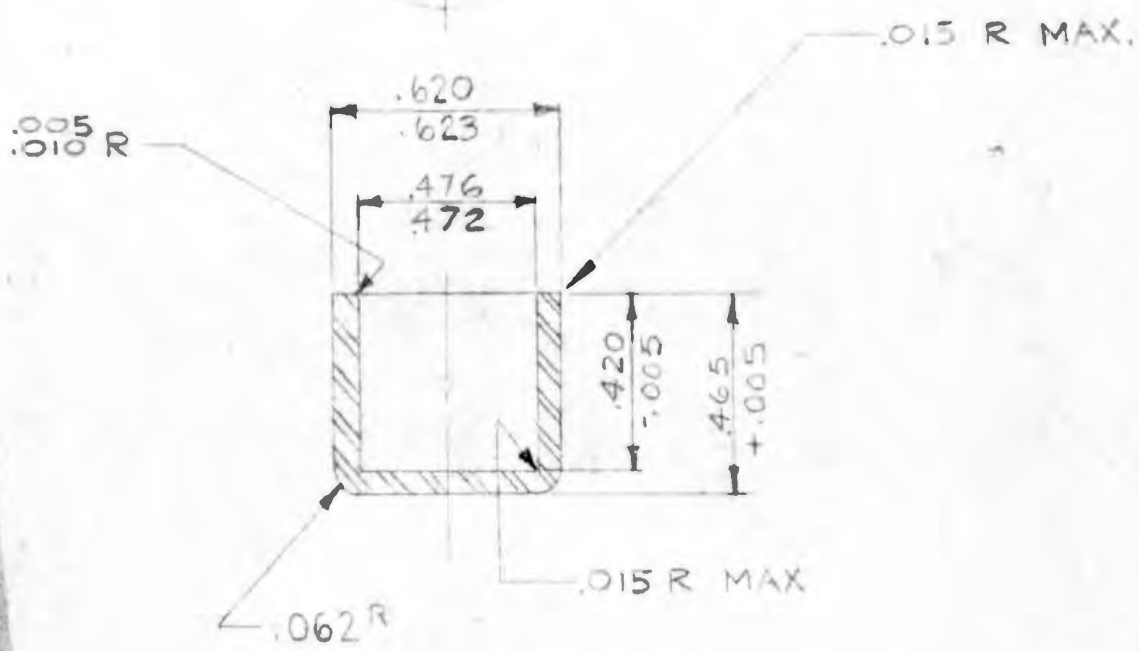
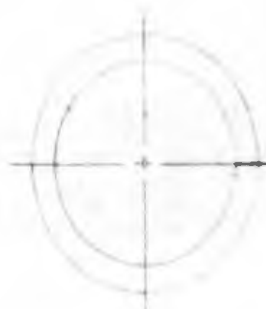


.220
.225

2

SYM	DESCRIPTION	DATE	APPROVAL
B		7-6-59	HK
A		2-28-59	HK
SYM	DESCRIPTION	DATE	APPROVAL

ORIGINAL DATE OF DRAWING 1-19-59	DRAFTSMAN WJ CHECKER HK	TRACER CHECKER ENGINEER ENGINEER	ARMATURE	ORDINANCE CORPS DEPT OF THE ARMY
	SUBMITTED ORD CORPS			
SCALE 2/1	UNIT WT	DWG SIZE B	8800940	SHEET OF



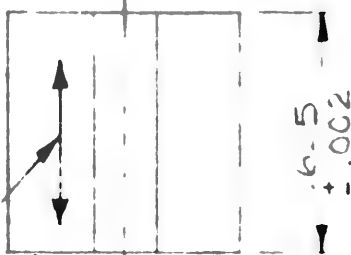
1

- 1 HARDEN TO ROCKWELL-40C
- 2 FINISH ALL OVER $\sqrt{32}$

PHYSICAL PROPERTIES				UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		ORIG
YP				TOLERANCES ON DECIMALS $\pm .005$		OF D
TS				ANGLES _____ FRACTIONS $\pm \frac{1}{64}$		DRAFT
EL 2				MATERIAL		TRACE
RA				STAINLESS STEEL-416		ENGIN
BH		NEXT ASSY	USED ON	HEAT TREATMENT		SUB
		APPLICATION				
RH		DO NOT	APPLY PART NO.	FINAL PROTECTIVE FINISH		APP
		DO	AS SPECIFIED			CHIEF



$$\frac{3}{32}R + \frac{1}{64}$$



GRIND
.002 (3)

1

MAGNETIZED IN THIS DIRECTION

NOTE: 125/ \checkmark ALL OVER TO BE AS NOTED.

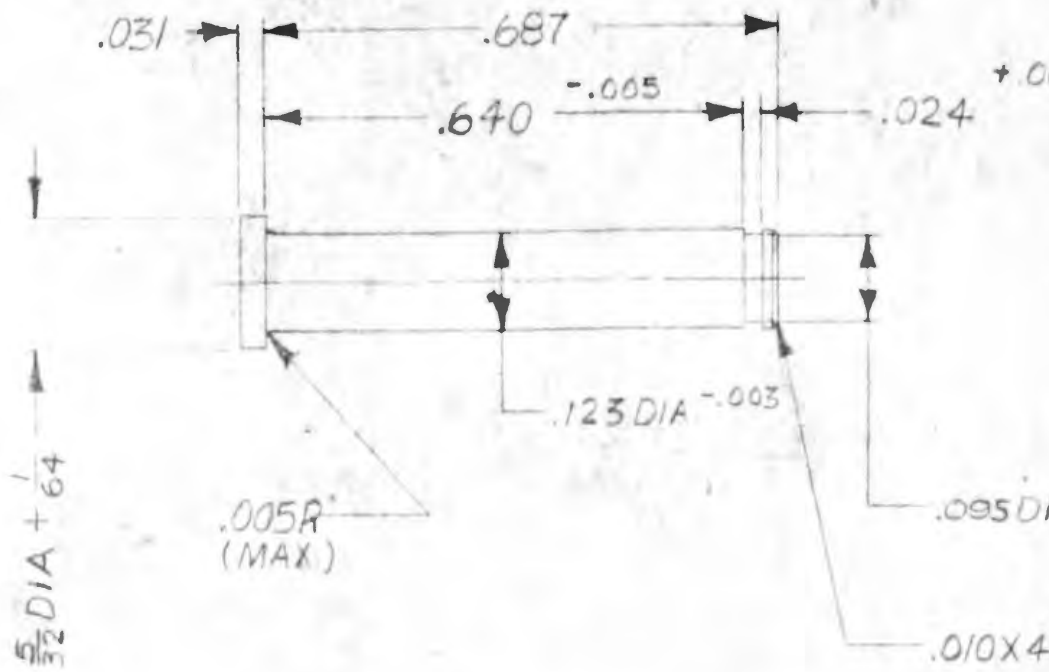
PHYSICAL PROPERTIES		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		ORIGINAL OF DRAWING
YP				DRAFTSMAN
TS				TRACER
EL 2				ENGINEER
RA				SUBMITTER
BH		NEXT ASSY	USED ON	
		APPLICATION		
RH		DO NOT	APPLY PART NO.	APPROVED
		DO	AS SPECIFIED	CHIEF OF ORD
			FINAL PROTECTIVE FINISH	
			MATERIAL MAGNET ALLOY CLASS B4, SPEC. QQ-M-60	
			HEAT TREATMENT	
			TOLERANCES ON DECIMALS	
			ANGLES	
			FRACTIONS	

GRIND PARALLEL WITHIN
.002 (SMOOTH FINISH)

2

SYM	DESCRIPTION	DATE	APPROVAL

INCHES	ORIGINAL DATE OF DRAWING	1-19-59	MAGNET	ORDNANCE CORPS DEPT OF THE ARMY	
	DRAFTSMAN	NS			CHECKER
TRACER		CHECKER			
ENGINEER		ENGINEER			
SUBMITTED					
	ORD CORPS				
	APPROVED BY ORDER OF THE CHIEF OF ORDNANCE				
	ORD CORPS				
	SCALE	2/1	UNIT WT		
	DWG SIZE	E	8800942		
	SHEET		OF		

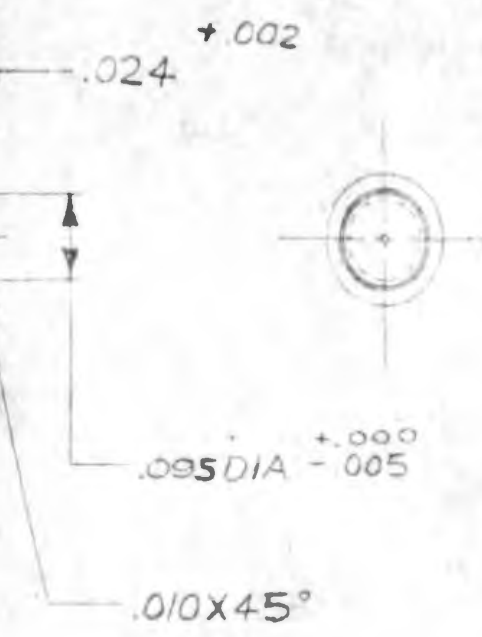


NOTE :-

FINISH ALL OVER \checkmark '63

1

PHYSICAL PROPERTIES				UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		ORIGINAL
YP				TOLERANCES ON DECIMALS $\pm .005$		OF DRAW
TS				ANGLES $- 1^\circ$	FRACTIONS	DRAFTSMAN
EL 2				MATERIAL STEEL, CORROSION-RESISTING CL1, TYPE A, SPEC QQ-S-763 (302 SS)		TRACER
RA				HEAT TREATMENT		ENGINEER
BH		NEXT ASSY	USED ON			SUBMITT
		APPLICATION				
RH		DO NOT	APPLY PART NO.	FINAL PROTECTIVE FINISH		APPROVE
		DO	AS SPECIFIED			CHIEF OF OR



2

SYM	DESCRIPTION	DATE	APPROVAL
REVISIONS			

IN INCHES .005	ORIGINAL DATE OF DRAWING 1-22-59	<h1 style="margin: 0;">PIN ARMATURE</h1>	ORDNANCE CORPS DEPT OF THE ARMY		
DRAFTSMAN <i>WS</i>	CHECKER <i>JH S.</i>		TRACER	CHECKER	
ENGINEER	ENGINEER		SUBMITTED		
ORD CORPS			DWG SIZE B	8800943	
APPROVED BY ORDER OF THE CHIEF OF ORDNANCE ORD CORPS		SCALE 4/1	UNIT WT	SHEET	OF



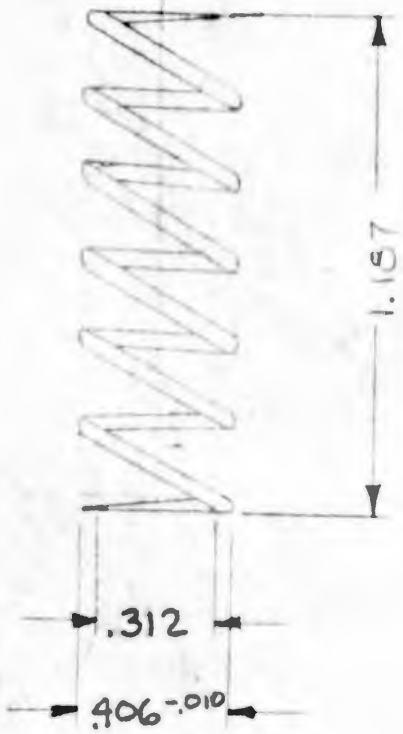
- SPECIFICATION

SOLID
TOTAL NO
NO ACTI
DIA. OF
ENDS C

1

PHYSICAL PROPERTIES				UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	ORIGINAL
YP				TOLERANCES ON DECIMALS $\pm .005$	OF DRAW
TS				ANGLES $\pm \frac{1}{2}^\circ$ FRACTIONS $\pm \frac{1}{64}$	DRAFTSMAN
EL 2				MATERIAL MUSIC WIRE	TRACER
RA				HEAT TREATMENT	ENGINEER
BH		NEXT ASSY	USED ON		SUBMITT
		APPLICATION		FINAL PROTECTIVE FINISH	APPROVE
RH		DO NOT	APPLY PART NO.		CHIEF OF OR
		DO	AS SPECIFIED		

SPECIFIC
 ASSEM
 LOAD
 SOLID
 NUMB
 DIREC
 MIN C
 LOAD
 ENDS
 SPRI
 APPR



1

PHYSICAL PROPERTIES				UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		ORIGIN OF DR DRAFTSM
YP				TOLERANCES ON DECIMALS _____		
TS				ANGLES _____ FRACTIONS _____		TRACER
EL 2				MATERIAL WIRE, MUSIC, SPEC QQ-W-470		ENGINEER
RA				HEAT TREATMENT		SUBMIT
BH		NEXT ASSY	USED ON			
		APPLICATION				
RH		DO NOT	APPLY PART NO.	FINAL PROTECTIVE FINISH		APPROV CHIEF OF
		DO	AS SPECIFIED			

SPECIFICATIONS :

ASSEMBLED HEIGHT
 LOAD AT ASSEMBLED HEIGHT
 SOLID HEIGHT, NOT MORE THAN
 NUMBER OF COILS (APPROX. TOTAL)
 DIRECTION OF COILING
 MIN OPERATING HEIGHT
 LOAD AT MIN OPERATING HEIGHT
 ENDS CLOSED AND GROUND FLAT
 SPRING FUNCTIONS OVER ROD
 APPROX. WIRE DIA.

.515
 10LB ± 1LB
 .330
 6
 RH OR LH
 .340
 12.6LB ± 1LB
 .309-.002
 .040

2

SYM	DESCRIPTION	DATE	APPROVAL
B	ORIG. SPEC'S RETURNED/KOILCHK	6-9-59	
A	OPERATING SPEC. CHG'D	5-19-59	
REVISIONS			

DIMENSIONS ARE IN INCHES
 DECIMALS _____
 FRACTIONS _____
 MUSIC,
 V-470
 FINISH

ORIGINAL DATE OF DRAWING 1-19-59
 DRAFTSMAN *WS* CHECKER
 TRACER CHECKER
 ENGINEER ENGINEER
 SUBMITTED

 ORD CORPS
 APPROVED BY ORDER OF THE CHIEF OF ORDNANCE

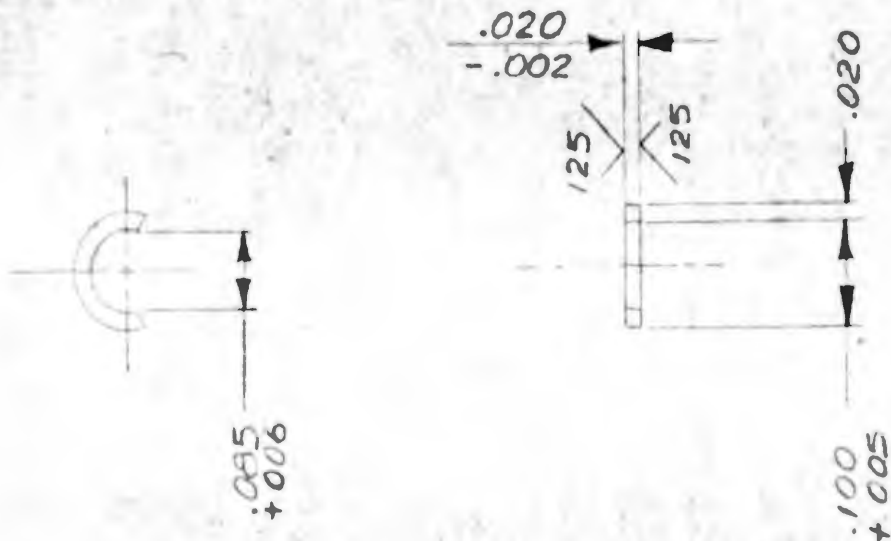
 ORD CORPS

ACTUATOR SPRING

SCALE 2/1 UNIT WT

ORDNANCE CORPS
 DEPT OF THE ARMY

DWG SIZE B
 8800945
 SHEET _____ OF _____



1

PHYSICAL PROPERTIES				UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	ORIGINAL DATA
YP				TOLERANCES ON DECIMALS	OF DRAWING
TS				ANGLES FRACTIONS	DRAFTSMAN <i>WJ</i>
EL 2				MATERIAL STEEL FS1060	TRACER
RA				SPEC QQ-S-633	ENGINEER
BH		NEXT ASSY	USED ON	HEAT TREATMENT	SUBMITTED
		APPLICATION			
RH		DO NOT	APPLY PART NO.	FINAL PROTECTIVE FINISH	APPROVED BY
		DO	AS SPECIFIED	NO. 1.1.1.3 OF MIL-STD (ORD)	CHIEF OF ORDNANCE

2

SYM	DESCRIPTION	DATE	APPROVAL

INCHES	ORIGINAL DATE OF DRAWING	1-22-59	RING, RETAINING, ARMATURE PIN	ORDNANCE CORPS DEPT OF THE ARMY	
	DRAFTSMAN	W.S.			CHECKER
TRACER		CHECKER			
ENGINEER		ENGINEER			
	SUBMITTED				
		ORD CORPS			
	APPROVED BY ORDER OF THE CHIEF OF ORDNANCE				
		ORD CORPS			
	SCALE 4/1	UNIT WT	DWG SIZE C	8800946	
			SHEET	OF	

PHYSICAL PROPERTIES		APPLICATION		A 8837118			
YP		HEAT ASST	USED ON-				
YS		0000934	FIRING DEVICE MS7	REVISIONS			
EL2				SYM	DESCRIPTION	DATE	APPROVAL
RA				A	EOPA 6896	3-23-61	<i>[Signature]</i>
BN							
BN							
		DO NOT	APPLY PART NO				
		00	-AS SPECIFIED-				

(A)

APPROVED SOURCE:
 MINNESOTA MINING AND MANUFACTURING CO.
 1000 BUSH AVE.
 ST. PAUL 6, MINNESOTA

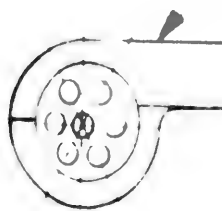
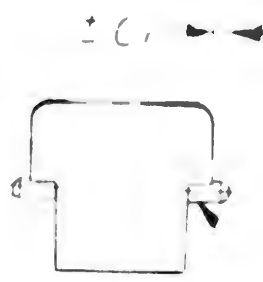
MINNESOTA MINING BLACK INSULATION TAPE .5 WIDE X 3.25 LONG X .007 THICK

ALL SOURCES MUST COMPLY WITH THE PHYSICAL AND FUNCTIONAL REQUIREMENTS OF THE MANUFACTURER'S ITEM INDICATED. ORDNANCE CORPS ENGINEERING APPROVAL REQUIRED.

NOTES:-
 1-SPEC MIL-G-2550 APPLIES.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON-	ORIGINAL DATE OF DRAWING	MAR 21 1960		TAPE	PICATINNY ARSENAL ORDNANCE CORPS DEPT OF THE ARMY DOVER, NEW JERSEY
	DECIMALS	DRAFTSMAN	CHECKED		
FRACTIONS	TRACED	ENGINEER	<i>[Signature]</i>		
ANGLES	ENGINEER	ENGINEER	<i>[Signature]</i>		
MATERIAL	SUC	<i>[Signature]</i>		SCALE	UNIT BY
HEAT TREATMENT	APPROVED BY ORDN OF THE CHIEF OF ORDNANCE		SHEET		
FINAL PROTECTIVE FINISH	<i>[Signature]</i>			OF	
			8837118		

NOTICE—WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



1

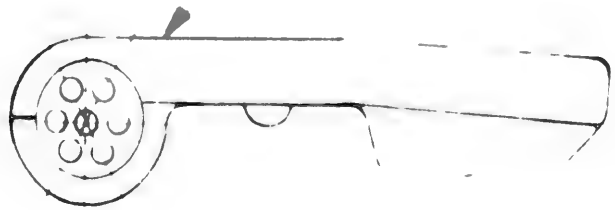
A. H. A. A.

NOTE:
1-SPE MIL-7-55 APPLIED.

		PHYSICAL PROPERTIES		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES	ORIGINAL DATE OF DRAWING	
		YP			DRAFTSMAN	CH
		TS		MATERIAL	TRACER	CH
		EL 2			ENGR	EN
		RA		HEAT TREATMENT	SUBMITTED	
		BH			APPROVED BY ORDER CHIEF OF ORDNANCE	
		RH		FINAL PROTECTIVE FINISH		
		APPLICATION				
DO NOT DO	APPLY PART NO AS SPECIFIED					
SEE ENGINEERING RECORDS						
NEXT ASSY	USED ON					
FIRING DEVICE M57						

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

-HANDLE



HANDLE ASSEMBLY

2

HANDLE PART NO. 453121

SPECIFIED INCHES AND ANGLES	ORIGINAL DATE OF DRAWING	HANDLE ASSEMBLY	WICATINNY ARSENAL ORDNANCE CORPS DEPT OF THE ARMY FORT MONMOUTH, N.J.		
	DRAFTSMAN CHECKER		DWG SIZE	B	
	TRACER CHECKER ENGR ENGR		SHEET	OF	
	SUBMITTED ORD CORPS		SCALE	/	UNIT WT
	APPROVED BY ORDER OF THE CHIEF OF ORDNANCE ORD CORPS				

PHYSICAL PROPERTIES		APPLICATION		A 8837121			
YP		NEXT ASSY	USED ON				
TS		SEE ENGINEERING RECORDS		REVISIONS			
EL2		C8800124	FIRING DEVICE	SYM	DESCRIPTION	DATE	APPROVAL
RA			M57	A	EOPA 6896	3-23-61	<i>[Signature]</i>
BM							
RH							
		DO NOT	APPLY PART NO.				
		DO	AS SPECIFIED				

(A)

APPROVED SOURCE:
 SANSON AND ROWLAND CO.
 186 W. LOUEN ST.
 PHILADELPHIA 20, PA.

SANSON CATALOG NO. 57, SECTION B, SCREW, BRASS, ROUND HEAD, PLAIN FLETSH #6(.139)-32TCx7/8 LONG.
 ALL SOURCES MUST COMPLY WITH THE PHYSICAL AND FUNCTIONAL REQUIREMENTS OF THE MANUFACTURER'S ITEM INDICATED. ORDNANCE CORPS ENGINEERING APPROVAL REQUIRED.

NOTES:-

- 1- SPEC MIL-G-2550 APPLIES.

ORDNANCE PART NO. 8837121

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON-	ORIGINAL DATE OF DRAWING	MAR 27, 1960	SCREW, MACHINE ROUND HEAD	PICATINNY ARSENAL ORDNANCE CORPS
	DECIMALS			
FRACTIONS	DRAFTSMAN	JS	DEPT OF THE ARMY	DOVER, NEW JERSEY
ANGLES	TRACER	CHECKED		
MATERIAL	ENGINEER	ASST ENGINEER	8837121	SHEET OF
HEAT TREATMENT	SUGGESTED	<i>[Signature]</i>		
FINAL PROTECTIVE FINISH	APPROVED BY ORDNANCE CHIEF OF ORDNANCE	<i>[Signature]</i>	A	59

PROPERTY		APPLICATION		A8837122			
YP		NEXT ASSY	USED ON				
YS		35-000003	FIRING DEVICE				
ELZ			M57				
RA				SYM	DESCRIPTION	DATE	APPROVAL
				A	EOPA 6896	3-23-61	<i>[Signature]</i>
BH							
RH							
		DO NOT	APPLY PART NO				
		00	AS SPECIFIED				

(A)

APPROVED SOURCE:
 BEARINGS INC.
 1607 W. HUNTING PARK AVE.
 PHILADELPHIA 40, PA.
 BEARINGS PART .125 DIA BALL, HARDEN STEEL, ROCKWELL 60 TO 65

ALL SOURCES MUST COMPLY WITH THE PHYSICAL AND FUNCTIONAL REQUIREMENTS OF THE MANUFACTURES ITEM INDICATED. ORDNANCE CORPS ENGINEERING APPROVAL REQUIRED.

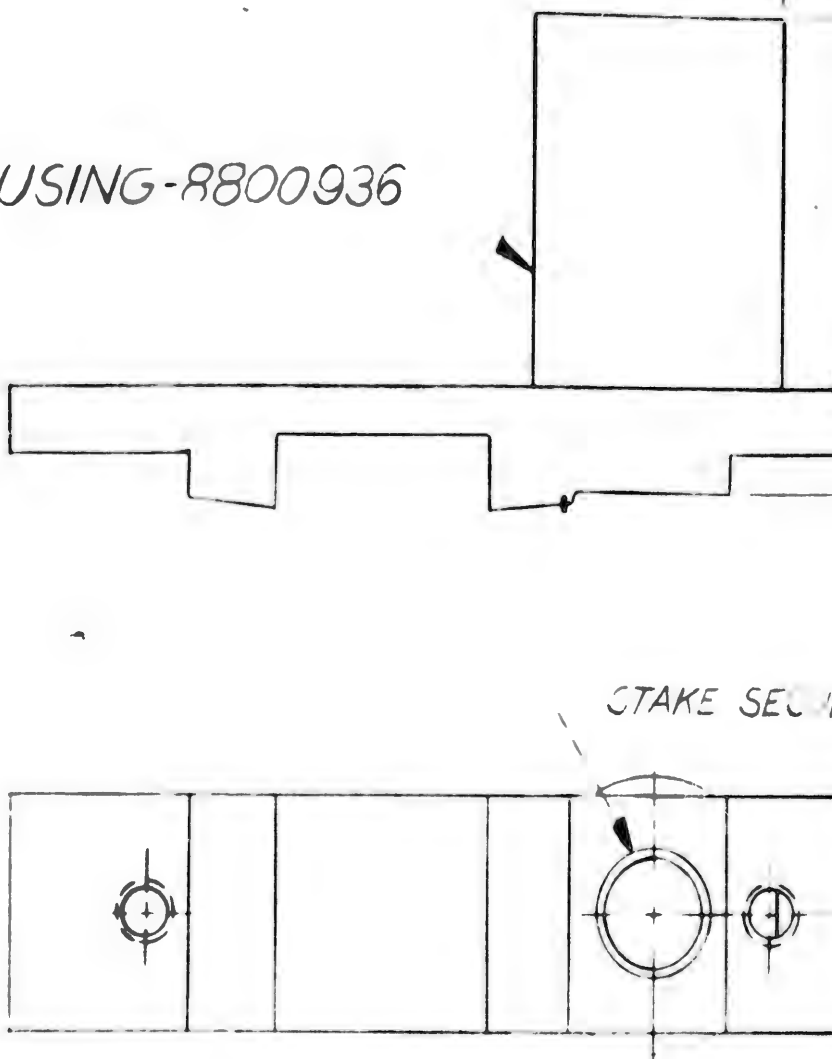
NOTES:-
 1-SPEC MIL-G-2550 APPLIES.

ORDNANCE PART NO. 8837122

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON -	ORIGINAL DATE OF DRAWING	MAR 21, 1960	BALL	PICATINNY ARSENAL ORDNANCE CORPS DEPT OF THE ARMY DOVER, NEW JERSEY		
	CRAFTSMAN	JB			CHECKED	JJ
DECIMALS						
FRACTIONS						
ANGLES						
MATERIAL	SUCHIFIED					
HEAT TREATMENT	<i>[Signature]</i>					
FINAL PROTECTIVE FINISH	APPROVED BY ORDER OF THE CHIEF OF ORDNANCE	<i>[Signature]</i>				
	SCALE		UNIT			
			NO. SHEET	A		
				8837122		

NOTICE—WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

HCUSING-8800936

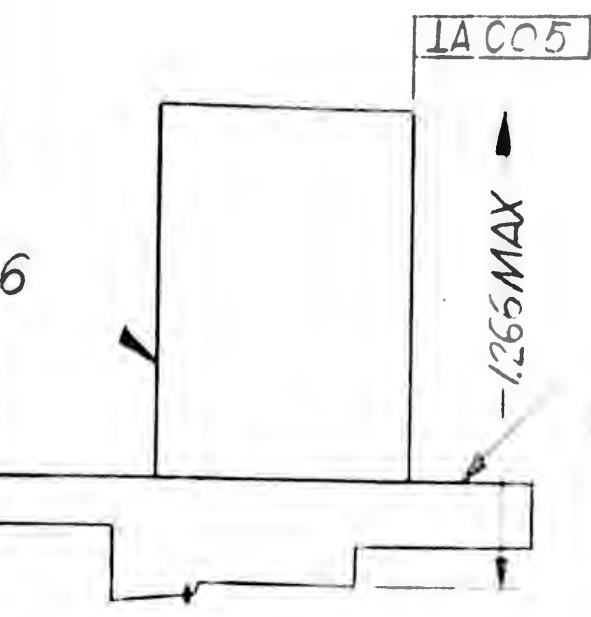


NOTES:-

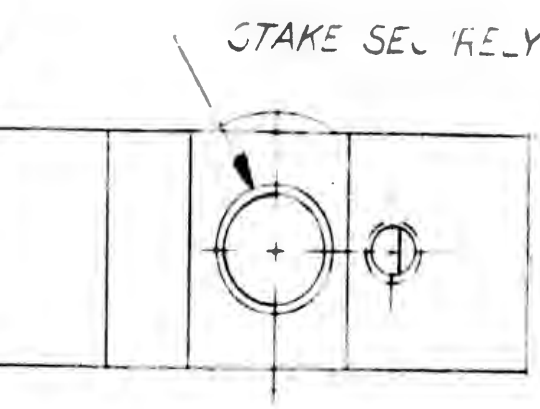
1-SPEC MIL-G-2550, MIL-T-8 AND 1-7 A PL.

		PHYSICAL PROPERTIES		UNLESS OTHERWISE SPECIFIED		ORIGINAL DATE OF DRAWING	
		YP		DIMENSIONS ARE IN INCHES		DRAFTSMAN	CHECKER
		TS		TOLERANCES ON		TRACER <i>VB</i>	CHECKER
		EL Z		FRACTIONS DECIMALS ANGLES		ENGR	ENGR
<i>C8800926</i>	<i>FIRING DEVICE</i>	RA		MATERIAL		SUBMITTED	
<i>SEE ENGINEERING REC RDS</i>	<i>M57</i>	BH		HEAT TREATMENT		ORD C	
NEXT ASSY	USED ON	RH		FINAL PROTECTIVE FINISH		APPROVED BY ORDER OF THE CHIEF OF ORDNANCE	
APPLICATION						ORD C	
DO NOT	APPLY PART NO					ORD C	
00	AS SPECIFIED						

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



PLATE, TOP
 8(1)138
 [-A-]



STAKE SECTION

2

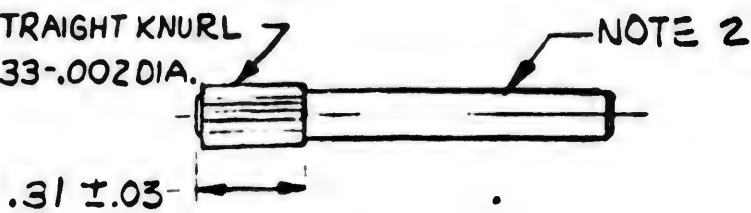
PLATE PART NO. 883714

SPECIFIED INCHES ANGLE	ORIGINAL DATE OF DRAWING DRAFTSMAN CHECKER TRACER <i>YB</i> CHECKER ENGR ENGR SUBMITTED APPROVED BY ORDER OF THE CHIEF OF ORDNANCE	TCF PLATE AND HOUSING ASSEMBLY	PICATINNY ARSENAL ORDNANCE CORPS DEPT OF THE ARMY DOVER, NEW JERSEY
	ORD CORPS	SCALE 2:1	UNIT WT
	ORD CORPS	DWG SIZE B	SHEET OF

PHYSICAL PROPERTIES		APPLICATION		A8837125			
YP		HEAT TREAT	USED ON-	REVISIONS			
YS		B9537120	FIXING DEVICE MST				
ELE				REV	DESCRIPTION	DATE	APPROVAL
RA				A	EOPA 6896	3-23-61	<i>[Signature]</i>
SM							
MI							
		DO NOT	APPLY PART NO.				
		DO	AS SPECIFIED				

(A)

MEDIUM STRAIGHT KNURL
ROLL TO .133-.002 DIA.



- NOTES:-
- 1-SPEC MIL-G-2550 APPLIES.
 - 2-MODIFY AS SHOWN FROM BFKX2-583512.

ORDNANCE PART NO. 8837125

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON- DECIMALS FRACTIONS ANGLES MATERIAL HEAT TREATMENT FINAL PROTECTIVE FINISH	ORIGINAL DATE OF DRAWING MAR 21, 1960	PIN, HANDLE	PICATINNY ARSENAL ORDNANCE CORPS DEPT OF THE ARMY DOVER, NEW JERSEY
	DRAFTERMAN TRACED ENGINEER		CHECKED CHECKED ENGINEER
	APPROVED BY ORDER OF THE CHIEF OF ORDNANCE <i>[Signature]</i>		SHEET A
	SCALE		SHEET OF

REDUCED SIZE PRINT

UNCLASSIFIED

UNCLASSIFIED