KEYS
357, 370, 375, 376, 377, 378, 379, 381, 382, 383, 388, 390, 391, 392, 393, 394, 395, 396, 397, 398, 426, 488, AND 511 TYPE AND NOS. 6002A, B, C, D, F, G, AND H AND ASSOCIATED LEVERS
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers 357, 370, 375, 376, 377, 378, 379, 381, 382, 383, 388, 390, 391, 392, 393, 394, 395, 396, 397, 398, 426, 488 and 511 type and Nos. 6002A, B, C, D, F, G, and H keys and their associated key levers.

1.02 This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.

1.03 Reference shall be made to Section 020-010-711, covering General Requirements and Definitions for additional information necessary for the proper application of the requirements listed herein.

1.04 Requirements are marked with an asterisk (*) when to check for them would necessitate the dismantling or dismounting of apparatus, or would affect the adjustment involved or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons or its performance indicates that such a check is advisable.

1.05 ***The normal (unoperated) position*** is that position in which the hard rubber plunger is resting against the key frame with all normally open contacts open, and all normally closed contacts closed.

1.06 ***The operated position of a push button type key*** is that position in which the plunger rod is depressed to the limit of its stroke with all normally open contacts closed and all normally closed contacts open.

1.07 ***Operated position of a key equipped with a 6A or similar type key lever*** is that position in which the lever is in the extreme rear position (Fig. 1), with all normally closed contacts open and all normally open contacts closed.

1.08 ***The operated positions of a key equipped with a No. 23A or similar type key lever*** are those positions in which the lever is in its extreme position on either side of the vertical. In one position the inner contacts are closed and in the other position the outer contacts are closed. When the lever is in the vertical (normal) position all contacts are open.

2. REQUIREMENTS

2.01 *Cleaning*

(a) Contacts shall be cleaned when necessary in accordance with the section covering cleaning procedures for key contacts.

(b) Other parts shall be cleaned in accordance with approved procedures.

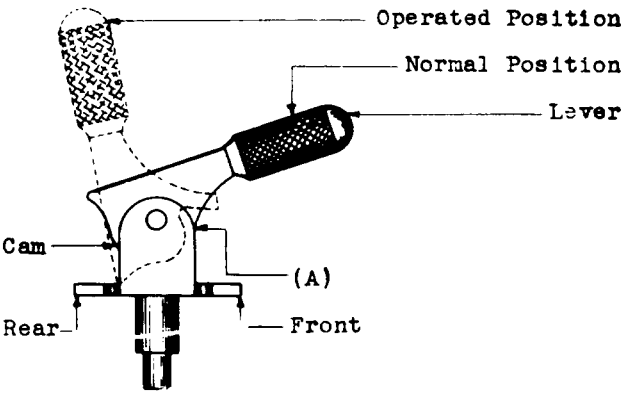

Fig. 1 – 6A Key Lever

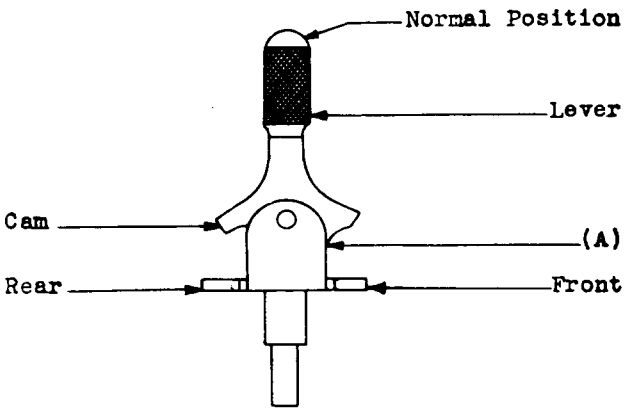

Fig. 2 – 23A Key Lever

2.02 ***Plunger and Lever Movement***

(a) Fig. 1(A) and Fig. 2(A): On keys equipped with a key lever the cam and the plunger rod shall move freely in their bearings.

Gauge by eye and feel.

(1) To check for bind in the operation of the plunger rod move the lever to the operated position and then restore it slowly to the normal position noting that the plunger follows the movement of the cam smoothly and that when the lever has returned to normal the plunger rests against the key frame.

(b) Fig. 6(A): On keys not equipped with a key lever the plunger rod shall move freely through its bearings and when released unrestrained shall return to its normal position with a snap.

Gauge by eye and feel.

2.03** ***Contact Alignment — Fig. 3(A): Contacts shall line up so that the point of contact falls wholly within the boundary of the opposing contact at all times during contact.

Gauge by eye.

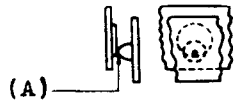

Fig. 3 – Contact Alignment

2.04** ***Plunger Travel: All contact requirements on keys equipped with a 6A or similar type key lever shall be met by the time the plunger has traveled

Max. 1/8″

Gauge by eye.

(a) When checking for contact separation, spring clearance, contact pressure, contact follow and contact sequence depress the plunger rod the specified distance and make the checks while holding the plunger rod in this position. A key which meets all the requirements with the plunger rod in this position will insure proper operation when the plunger rod is operated by the lever.

2.05** ***Contact Separation — Fig. 4(A): There shall be a separation between all open contacts of:

Min. .010″

Gauge by eye.

This requirement shall not apply to the outer break contact of the break-make combination of the 382A key in which case the contact separation shall be

Min. .008″

Gauge by eye.

2.06** ***Spring Clearance

(a) Fig. 4(B): There shall be a clearance between springs designed never to make contact and between any spring and the frame, whether in the operated or unoperated position of the key of:

Min. .014″

Gauge by eye.

(b) Fig. 4(C): The plunger springs shall rest against the plunger except in the case of keys having normally closed inner contacts, in which case the separation between the plunger and the plunger springs shall be:

Min. .005″

When the plunger can be rotated this requirement shall be met in all positions of rotation of the plunger.

Gauge by eye.

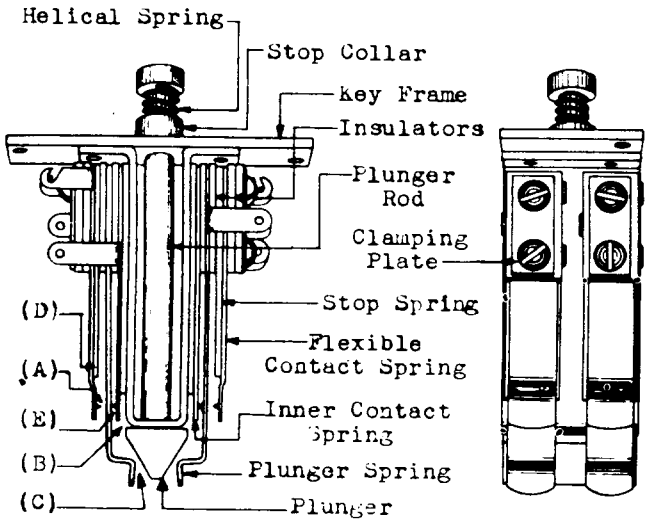

Fig. 4 – 392A Key

*2.07 ***Contact Pressure*** — Fig. 4(A) and (E)

(a) There shall be a pressure between normally closed plunger spring contacts of:

Test — Min. 155 grams
Readjust — Min. 170 grams

Use the No. 62B or 79C gauge.

(b) There shall be a pressure between all other contacts when closed of:

Test — Min. 50 grams
Readjust — Min. 55 grams

This requirement shall not apply to the outer break contact of the break-make combination of the 382A key, in which case the pressure shall be:

Test — Min. 40 grams
Readjust — Min. 45 grams

Use the No. 68B or 79C gauge.

*2.08 ***Contact Follow*** — Fig. 4(A): There shall be a follow on all normally open contacts of:

Min. .008″

Gauge by eye.

*2.09 ***Contact Sequence***

(a) Fig. 5(A) — ***Normal Contact Sequence — Break-Make Combinations:*** Unless otherwise specified the normally closed contacts operated directly by a plunger spring of an individual spring combination shall break before the normally open contacts of the same spring combination directly associated with that plunger spring make by:

Min. .005″

Gauge by eye.

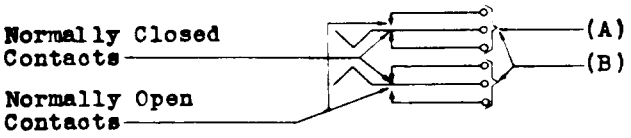

Fig. 5 – Contact Sequence

(b) Fig. 5(B) — ***Cross Sequence — Break-Make Spring Combinations on Ringing and Coin Control Spring Combinations and Where Otherwise Specified:*** Unless otherwise specified all normally closed contacts operated by the depression of the plunger or by the throw of the lever shall break before any of the open contacts make by:

Min. .005″

Gauge by eye.

(c) ***Other Contact Sequences:*** When specified on the circuit drawing.

*2.10 ***Flexible Contact Spring Position*** — Fig. 4(D): With the key in its normal position the flexible spring shall rest at least on the end of the stop spring that is nearest the contact on the flexible spring.

Gauge by eye.

2.11 ***Plunger Operate Pressure*** — Fig. 6(A): The pressure required to operate a plunger to the limit of its stroke shall be within one of the following sets of limits.

*(a) Keys equipped with a No. 6A or similar-type key lever.

	WITH LESS THAN 6 SPRING COMB.		WITH 6 OR MORE SPRING COMB.	
Test and Readj	Min 650 Grams	Max 3200 Grams	Min 650 Grams	Max 5500 Grams

Use the No. 79F gauge.

Exception: For the No. 392J key, the pressure required to depress the plunger 5/32 inch shall be maximum 4100 grams.

(b) Keys not equipped with a No. 6A or similar-type key lever.

	WITH LESS THAN 6 SPRING COMB.		WITH 6 OR MORE SPRING COMB.	
Test	Min 550 Grams	Max 3200 Grams	Min 550 Grams	Max 5500 Grams
Readj	Min 650 Grams	Max 3200 Grams	Min 650 Grams	Max 5500 Grams

Use the No. 79F gauge.

Exception: For the No. 392J key, the pressure required to depress the plunger 5/32 inch shall be maximum 4100 grams.

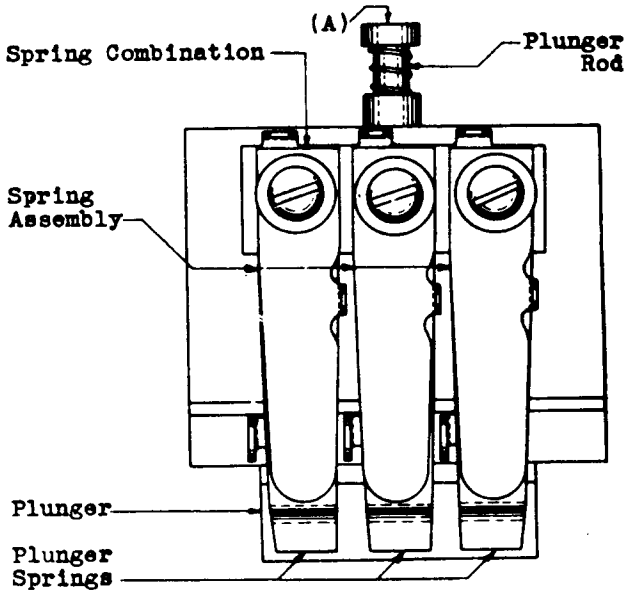

Fig. 6 – 370 Type Key

3. ADJUSTING PROCEDURES

3.001 *List of Tools, Gauges, and Materials*

CODE NO.	DESCRIPTION
TOOLS	
485A	Smooth-Jaw Long Nose Pliers
—	KS-7782 Parallel Jaw Pliers
—	3″ Cabinet Screwdriver
GAUGES	
62B	0-700 Gram Gauge
68B	70-0-70 Gram Gauge
79C	0-200 Gram Push-Pull Tension Gauge
79F (or the replaced 79D and 79E)	0-6000 Gram Push-Pull Tension Gauge
MATERIALS	
—	D-98063 Cloth or KS-2423 Cloth
—	Toothpicks — Hardwood, flat at one end and pointed at the other
KS-7860	Petroleum Spirits

3.01 ***Cleaning*** (Reqt 2.01)

(1) Clean the contacts in accordance with the section covering cleaning procedures for key contacts. Clean other parts in accordance with the procedures outlined in 3.02, (1), (2) and (4) and 3.11, (2) to (4) inclusive.

3.02 ***Plunger and Lever Movement*** (Reqt 2.02)

(1) If the lever of keys equipped with a No. 6A or similar type key lever does not operate freely or if the plunger rod does not follow the operation of the lever smoothly remove the lever and associated rubber stud and clean the rubber stud with a clean, dry D-98063 cloth. Clean the lever and cam thoroughly by wiping with a D-98063 cloth slightly moistened with petroleum spirits. Before remounting the key lever check that the plunger rod moves freely through its bearings and if it does not proceed as outlined in (2) and (3).

(2) If a plunger rod binds in the key frame it is probably due to dirt. Place a few drops of petroleum spirits in the slot between the plunger rod and the key frame, operate the plunger rod a few times and then wipe it with a clean, dry D-98063 cloth. Repeat this operation a number of times until all the dirt has been removed.

(3) If the bind is not due to the above conditions see whether it is caused by a roughened or bent plunger rod. To check this, first remove the key from the mounting using the 3" cabinet screwdriver to remove the mounting screws. Then grasp the plunger firmly and holding it securely, turn the plunger rod in a counterclockwise direction with the fingers or if necessary with the long nose pliers until the plunger rod can be withdrawn from the key frame. Take care not to lose the helical spring or the stop collar when the plunger rod is withdrawn. If the plunger rod is roughened or bent replace it with a new one. If the helical spring is broken or distorted replace it with a new one.

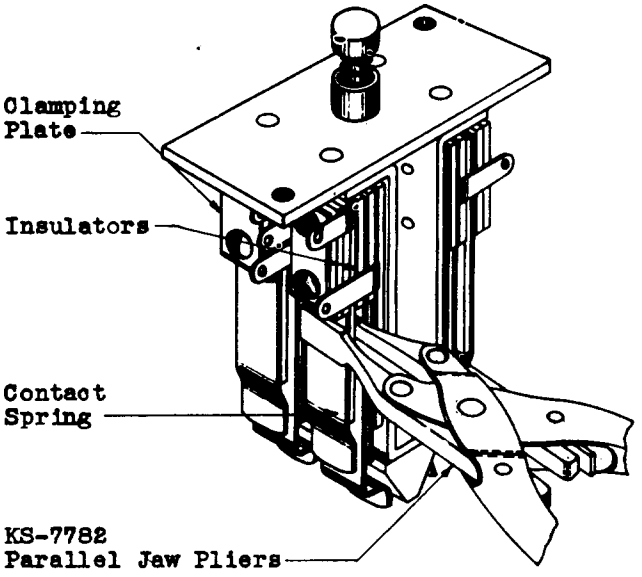

Fig. 7 – Method of Adjusting for Contact Separation

(4) Clean the surfaces of the plunger springs nearest the plunger thoroughly by wiping with a D-98063 cloth slightly moistened with petroleum spirits. Clean the hard rubber plunger by wiping it with a clean, dry D-98063 cloth.

(5) After the cleaning has been completed reassemble the key and recheck for plunger movement.

(6) At this time, before mounting the key, check the other requirements specified and make the necessary readjustments as covered in the subsequent adjusting procdures.

3.03 ***Contact Alignment*** (Reqt 2.03)
3.04 ***Plunger Travel*** (Reqt 2.04)
3.05 ***Contact Separation*** (Reqt 2.05)
3.06 ***Spring Clearance*** (Reqt 2.06)
3.07 ***Contact Pressure*** (Reqt 2.07)
3.08 ***Contact Follow*** (Reqt 2.08)
3.09 ***Contact Sequence*** (Reqt 2.09)
3.10 ***Flexible Contact Spring Position*** (Reqt 2.10)

(1) In making these adjustments consult the associated circuit drawing and circuit requirement table and give proper consideration to the maintenance of any requirement for contact sequence which may be specified thereon. Unless otherwise specified adjust the springs close to the point where the spring leaves the spring assembly clamping plates and insulators, with KS-7782 pliers, as shown in Fig. 7. In adjusting the springs take care not to kink them. Kinked springs should not be straightened unless the kink interferes with the proper adjustment of the key. Removing kinks tends to weaken the spring and shorten the life of the key. In readjusting a key to meet these requirements it may be necessary if the key is equipped with more than four spring combinations to remove one or more of the spring combinations from the key frame in order to gain access to the spring combinations requiring adjustment.

(2) ***Contact Alignment:*** First check the springs for alignment. If necessary to shift the springs loosen the spring assembly mounting screws with a 3" cabinet screwdriver on that side of the key where the springs are out of alignment. Then shift the springs so that they are in alignment and tighten the mounting screws securely. When mounted the springs should be as nearly parallel to the key frame as can be judged by eye and the contacts should rest wholly within the circumference of the opposing contact discs and as near the center as possible.

(3) ***Contact Separation and Spring Clearance:*** When readjusting contact springs, take care to adjust the springs in line with their movement and not to twist the contacts off-center.

(4) If the tip end of a flexible contact spring is slightly distorted it will be permissible to adjust it at the shoulder with the 485A

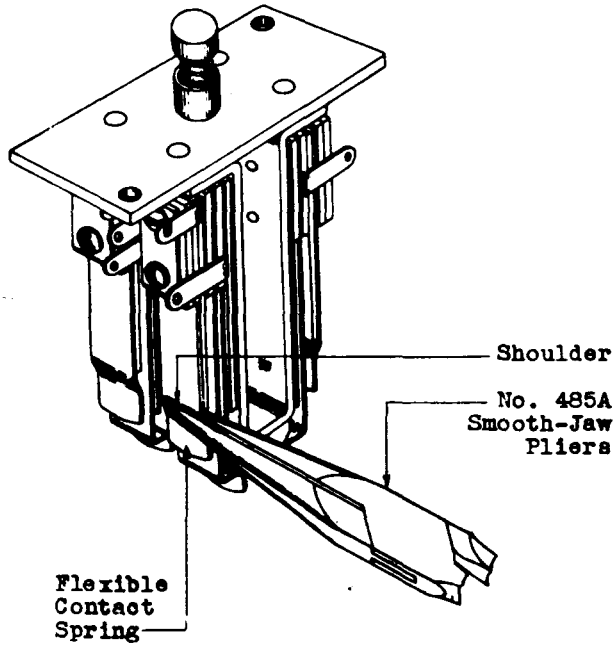

Fig. 8 – Method of Adjusting Tip of Flexible Contact Spring

pliers, applied as shown in Fig. 8. This practice should, however, be avoided whenever possible due to the possibility of breakage of the spring.

(5) Failure to meet the specified clearance between springs designed never to make contact may be due to the springs being distorted. Straightening the springs will usually rectify any trouble which may exist because of springs touching each other which are designed to clear at all times.

(6) If the plunger springs fail to clear the plunger satisfactorily on keys equipped with inner contacts, examine the springs to determine whether or not they are distorted. Straighten them with the KS-7782 pliers, exercising care to maintain a satisfactory contact pressure on the inner contacts. In case difficulty is experienced in obtaining the proper clearance by adjusting the plunger springs close to the point where the springs leave the clamping plates and insulators, the straight portion of the spring nearest the offset may be given a slight bend toward or away from the plunger. Do not attempt to adjust the offset portion of the plunger springs.

(7) ***Contact Pressure:*** Foreign matter wedged between the contact springs may prevent the springs making contact when the lever or plunger is operated. Remove the foreign matter with a toothpick which has been dipped in petroleum spirits. Do not use the same toothpick for more than one operation.

(8) ***Contact Follow:*** If the follow requirement cannot be met by adjusting the springs close to the point where they leave the assembly clamping plates and insulators, the upper part of the spring just below the contact disc may be given a slight bend toward the plunger spring with the 485A pliers. This bend should not be enough however, to make a visible kink in the spring. It should be noted at this time that the flexible springs rest against the stop springs at least at the contact end of the springs when the plunger is in the unoperated position. Take care in making this adjustment to maintain the minimum contact separation. If a satisfactory contact follow cannot be obtained with a flexible contact spring determine whether or not it is distorted and if necessary readjust it as described in (3), (4) and (9).

(9) ***Flexible Contact Spring Position:*** See if the flexible contact springs rest for their entire length against the corresponding stop springs. In cases where this is not possible due to a previous distortion of the flexible contact springs adjust the springs as follows: Insert a piece of No. 22 bare tinned copper wire between the two springs close to the point where they leave the clamping plate and insulators. Then place the KS-7782 pliers over both the stop spring and the flexible contact springs close to the point where the wire was inserted as shown in Fig. 9. Compress the pliers, and then remove the wire. When the contacts are fully made the flexible contact springs should be held slightly away from their stop springs. This indicates that the contacts have a follow which insures sufficient contact pressure.

(10) ***Contact Sequence:*** To adjust for contact sequence increase or decrease the contact separation, contact pressure, contact follow and spring clearance as required as outlined in (2) to (9) inclusive.

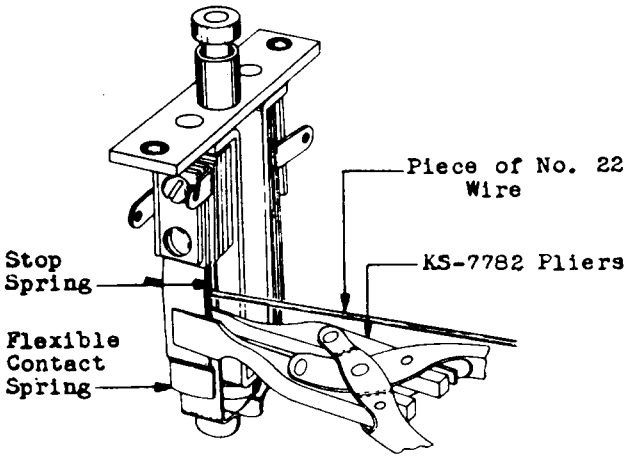

Fig. 9 – Method of Adjusting Flexible Contact Spring

3.11 *Plunger Operate Pressure* (Reqt 2.11)

(1) In adjusting to meet these requirements, first examine the helical spring to determine whether it is broken or distorted in any way and if so, replace it with a new one as described in 3.02, (3).

(2) Examine the plunger springs to determine whether a gummy substance has formed on them. If it is found necessary to clean the plunger springs remove the hard rubber plunger as described in 3.02, (3).

(3) Clean the surface of the spring nearest the plunger by wiping with a D-98063 cloth slightly moistened with petroleum spirits. Clean the hard rubber plunger by wiping it with a clean, dry D-98063 cloth and remount the plunger.

(4) If, after cleaning the springs, the key still fails to meet the plunger operate pressure requirement determine whether the plunger spring tension is excessive and if necessary decrease the tension of these springs by adjusting them with the KS-7782 pliers.

(5) Do not use lubricant on the key plunger to facilitate this adjustment.

(6) If the key fails to meet the minimum requirement, tension the springs as required with the KS-7782 pliers as outlined in 3.03-3.10, (1).

(7) Whenever the plunger springs are either tensioned or weakened, keep the tensions of the springs as nearly equal as possible.

(8) After all adjustments have been made assemble the key and remount it in its mounting.