DESCRIPTION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE M MAGNETIC CONTACTORS

Frames 301, 401, 501, 601 and 701

Direct Current Single Pole Spring Closed

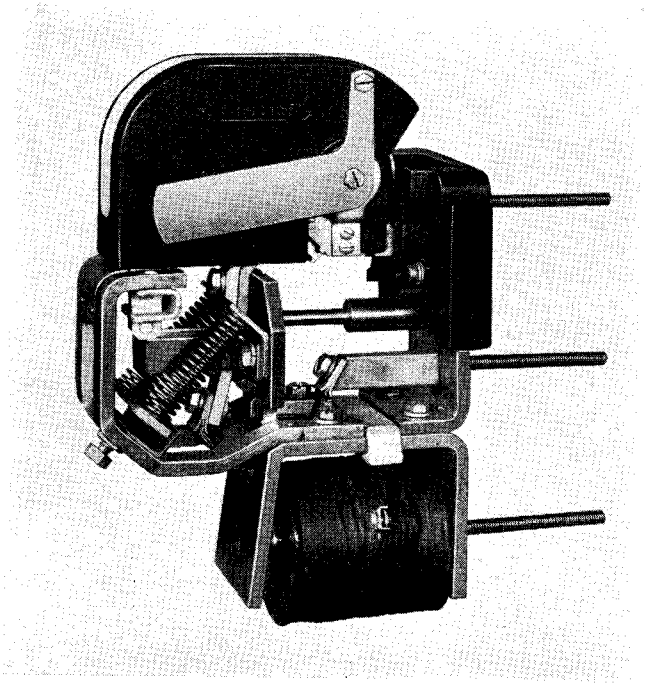

FIG. 1. Type M-301 Rear Connected Contactor Spring-Closed

TYPE M CONTACTORS of these frame sizes are heavy duty magnetically operated contactors designed primarily for steel mill applications. The ratings are listed in Table No. 1.

Contactors are insulated for 600 volts maximum. The operating coils are rated for continuous duty and will operate the contactors at 80% to 110% of their rated voltage.

DESCRIPTION

The contactors are of unit construction with all parts assembled on a common frame. The armature hinges on a knife edge bearing which has an extremely long life and requires little maintenance.

The operating springs close the contacts when its coil is de-energized. The force exerted by the springs may be varied by means of an adjusting screw.

The arc shield, which is supported by the blowout pole pieces, is capable of being swung upward for inspection of the contacts. It may be removed altogether by simply withdrawing the bolt at the top rear of the arc box. An arc horn in the arc shield relieves the moving contact of excessive burning. The arc which is drawn between the contacts when the contactor opens moves outward under the influence of the magnetic blowout field and transfers from the moving contact to the arc horn.

The latter is maintained at the potential of the moving contact by connection to the stop bracket through a blade which projects from the bottom of the arc shield. Electrical contact to the blade is maintained, when the arc shield occupies its lowered, operating position, by a pair of silver alloy faced jaws. The moving contact support is hinged on the armature in a nitrided steel knife edge bearing so that the moving contact slides as the armature closes. The amount of slide is sufficient to keep the contacts free of oxides and scale, a provision essential to maintaining good contact with copper surfaces.

Table No. 1. RATINGS

CONTACTOR TYPE	M-301	M-401	M-501	M-601	M-701
Voltage Rating	600	600	600	600	600
8 Hour Ampere Rating	100	150	300	600	900
1 Hour Ampere Rating	133	200	400	800	1200

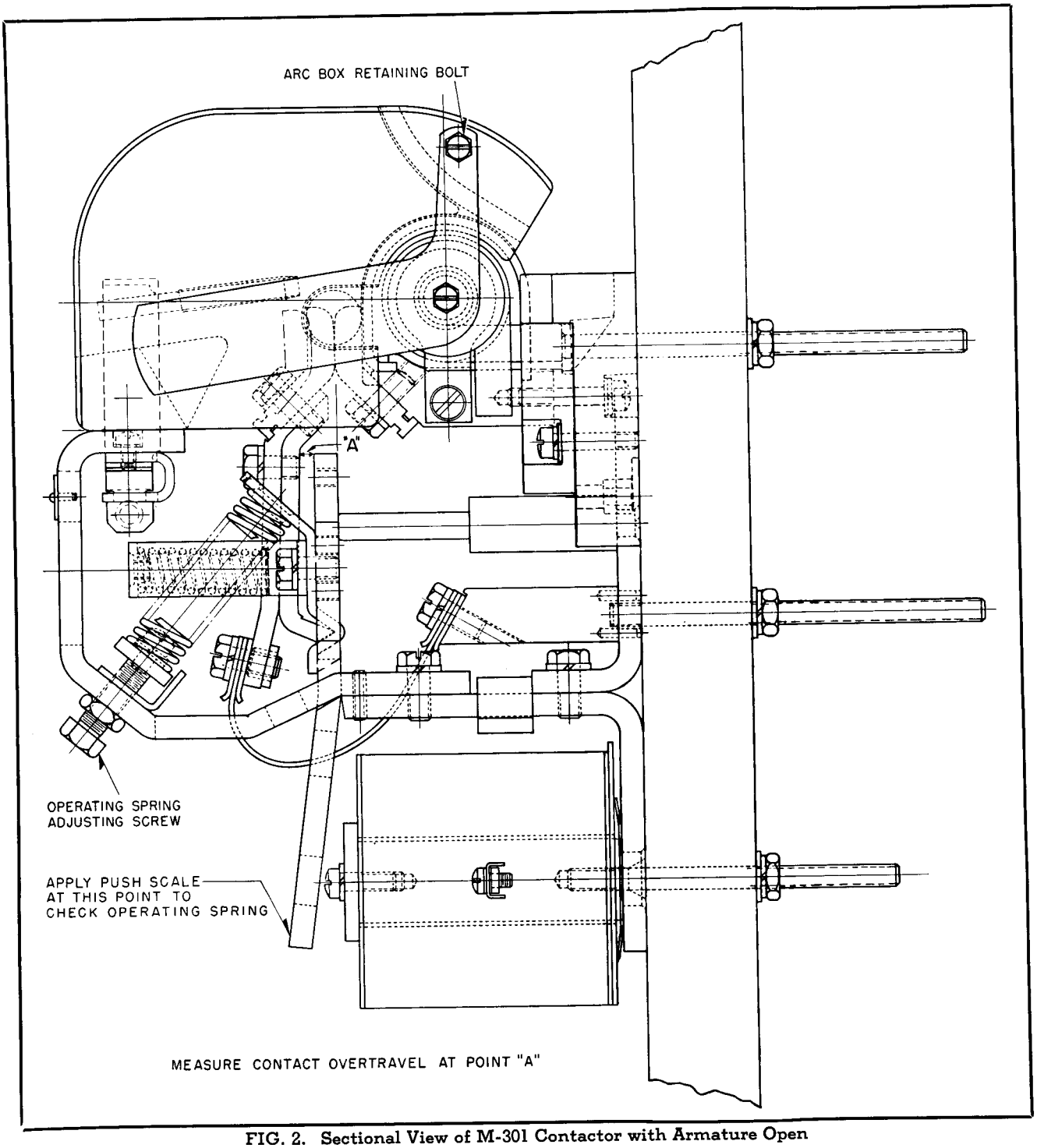

FIG. 2. Sectional View of M-301 Contactor with Armature Open

OPERATION

The contactor is designed to operate with a positive snap action free of the creeping often experienced with spring closed contactors. In the unenergized state, the armature is at rest against a post situated above the main magnet, and below the stationary contact assembly. When the operating coil is first energized, the presence of a heavy copper ring encircling the path of the main flux insures the existence of sufficient leakage flux through the stop post to momentarily freeze the armature against it. As the current in the operating coil approaches its steady state condition, its rate of change decreases and the blocking action of the short-circuiting ring diminishes, and finally the armature is attracted toward the main core in a fast positive movement.

ELECTRICAL INTERLOCKS

The contactors will accommodate a total of two Type L-61 electrical interlocks either of which may be selected to have the following:

A. One normally open contact.

B. One normally closed contact.

C. One normally open and one normally closed (independent) contact.

D. Two normally open independent contacts.

E. Two normally closed independent contacts.

The Type L-61 electrical interlock, shown in Fig. 1, comprises a contact assembly which is mounted as a unit on the molded base of the contactor, and an operating finger which is carried by an insulating block secured to the contactor armature.

For more complete information refer to Instruction Leaflet I.L. 15-829-1.

The addition of interlocks necessitates readjustment of operating springs. See final paragraph of this I. L.

INSTALLATION AND MAINTENANCE

Mounting. The contactors are held to the panel by three mounting studs, the upper and lower of which make provision for electrical connections.

Connections are normally made behind the panel. Should it be desired to make the connections in front of the panel, the contactor can be supplied with a pair of connecting straps and studs, the latter to be positioned on the insulating panel below the contactor.

The contactors are suitable for mounting only on insulating panels, up to 3 inches thick. As the frame is of the same potential as the moving contact, special insulating precautions must be taken if a contactor is to be mounted on a conducting surface.

Arc Shield. The arc shield and its arc horn are essential to the performance of the contactor and these parts should always be in place. The arc shield should always be pushed down so that it rests on the spring bracket. This insures proper engaging of the knife blade with the contactor switch jaws. The arc shield may be removed by first removing the arc box retaining bolt, which is located at the top of the L shaped side plates. Then raising the arc shield until the knife blade clears the stop bracket, pull the arc shield forward clear of the contactor.

In replacing the arc shield care must be taken that the pole piece plugs are aligned with the recesses in the arc shield walls to permit proper reassembly. The arc box retaining bolt is made of non-magnetic material. A steel bolt used in this location will short circuit the magnetic blow-out field and impair interruption of the arc.

Armature and Bearing. The knife edge bearing requires no maintenance. A shelf is provided on the armature plate to prevent falling dust and dirt collecting between the armature and frame. Oil should not be used at any point on this contactor.

On Types M-301, 401 and 501 the magnet pole face is secured to the core by means of a non-magnetic bolt having a head that projects forward into a hole in the armature. When properly assembled this bolt head is centered in the hole.

Operating Coil. When a new operating coil is installed the identification label should be examined to make certain that the voltage rating and the coil style number are correct for the application. The more commonly used operating coils are listed in Table No. 2.

Note: Avoid contact with operating coils. Operating coils are insulated for and operate normally at high temperatures.

All spring closed contactors have class H coils which operate at a temperature rise of approximately 150°C. The surface temperature of these coils will be higher than that of class A coils.

Steps to follow in removing operating coil are:

1. Raise arc shield.

2. Remove the two bolts securing the spring bracket to the frame.

3. Disconnect shunt from lower stud. This permits removal of the armature and spring bracket assembly.

4. Remove pole face bolts.

5. Disconnect leads and slide coil forward until it clears the magnet core.

Table No. 2. OPERATING COILS

CONTACTOR TYPE	COIL STYLE NUMBER		
	115 VOLTS	230 VOLTS	550 VOLTS
M-301 } M-401 }	1419 544	1419 545	1419 546
M-501	1419 552	1419 553	1419 554
M-601 } M-701 }	1419 564	1419 565	1419 566

Contacts. Oil or other lubricants should not be used on the copper contacts. Filing and dressing the contacts is unnecessary.

The moving and stationary contacts may be removed by removing the bolts holding the contacts to their respective supports. The bolt heads are slotted to permit use of a screwdriver.

Table No. 3. CONTACT CHARACTERISTICS

CONTACTOR TYPE	CONTACT FORCE IN POUNDS		*CONTACT OVERTRAVEL (INCHES)	CONTACT GAP (INCHES)
	INITIAL	FINAL		
M-301 } M-401 }	2¼ to 2¾	3½ to 4½	3/16	5/16 ± 1/16
M-501	7¼ to 8¾	8½ to 10½	13/64	5/16 ± 1/16
M-601 } M-701 }	14½ to 17½	22½ to 27½	11/32	½ ± 1/16

*Dimension "A" on Fig. 2

When the contacts are new and the armature is closed either electrically or mechanically the gap between the contact support bracket and the top of the armature plate, dimension "A" in Fig. 3, should be as shown in Table No. 3. Change contacts when this dimension is reduced to 1/32 inch.

The contact gap and spring forces, with new contacts, should be as shown in Table No. 3.

To measure the final contact force, close the contactor and by means of a spring scale hooked to a loop of wire measure the force necessary to separate the contacts. Consideration must be given the diameter of the wire used in comparing values read with the tabulated values in this leaflet.

If after new contacts are installed, the forces are not correct, it may be necessary to replace the contact spring, or adjust the number of spring shims in the spring seat.

Failure of the magnet to close the contactor may result from an open circuited operating coil, from a circuit condition in which the voltage is low, from friction between parts, or from improper operating spring adjustment. After the contacts have worn considerably, readjustment of the operating spring forces may be necessary.

OPERATING SPRINGS

When the operating springs are properly adjusted a push scale applied 1/8" up from the bottom edge of the armature should read as follows:

M-301—M-401 ..... ¾ pounds
M-501 ..... 1½ pounds
M-601—M-701 ..... 1¾ pounds

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BUFFALO PLANT • MOTOR AND CONTROL DIVISION • BUFFALO 5, N. Y.
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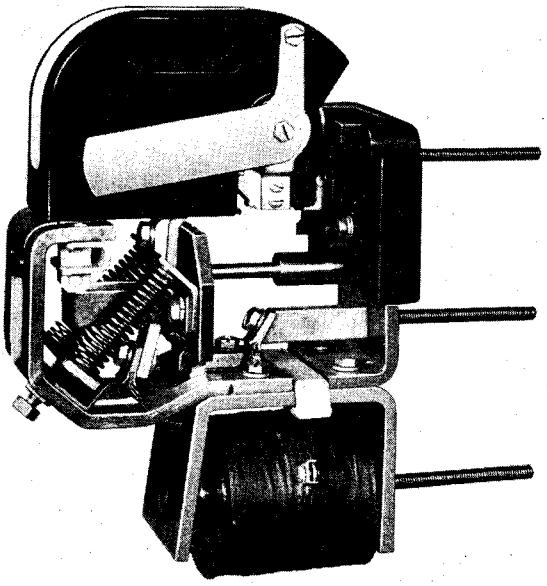

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The arc shield, which is supported by the blowout pole pieces, is capable of being swung upward for inspection of the contacts. It may be removed altogether by simply withdrawing the bolt at the top rear of the arc box. An arc horn in the arc shield relieves the moving contact of excessive burning. The arc which is drawn between the contacts when the contactor opens moves outward under the influence of the magnetic blowout field and transfers from the moving contact to the arc horn.

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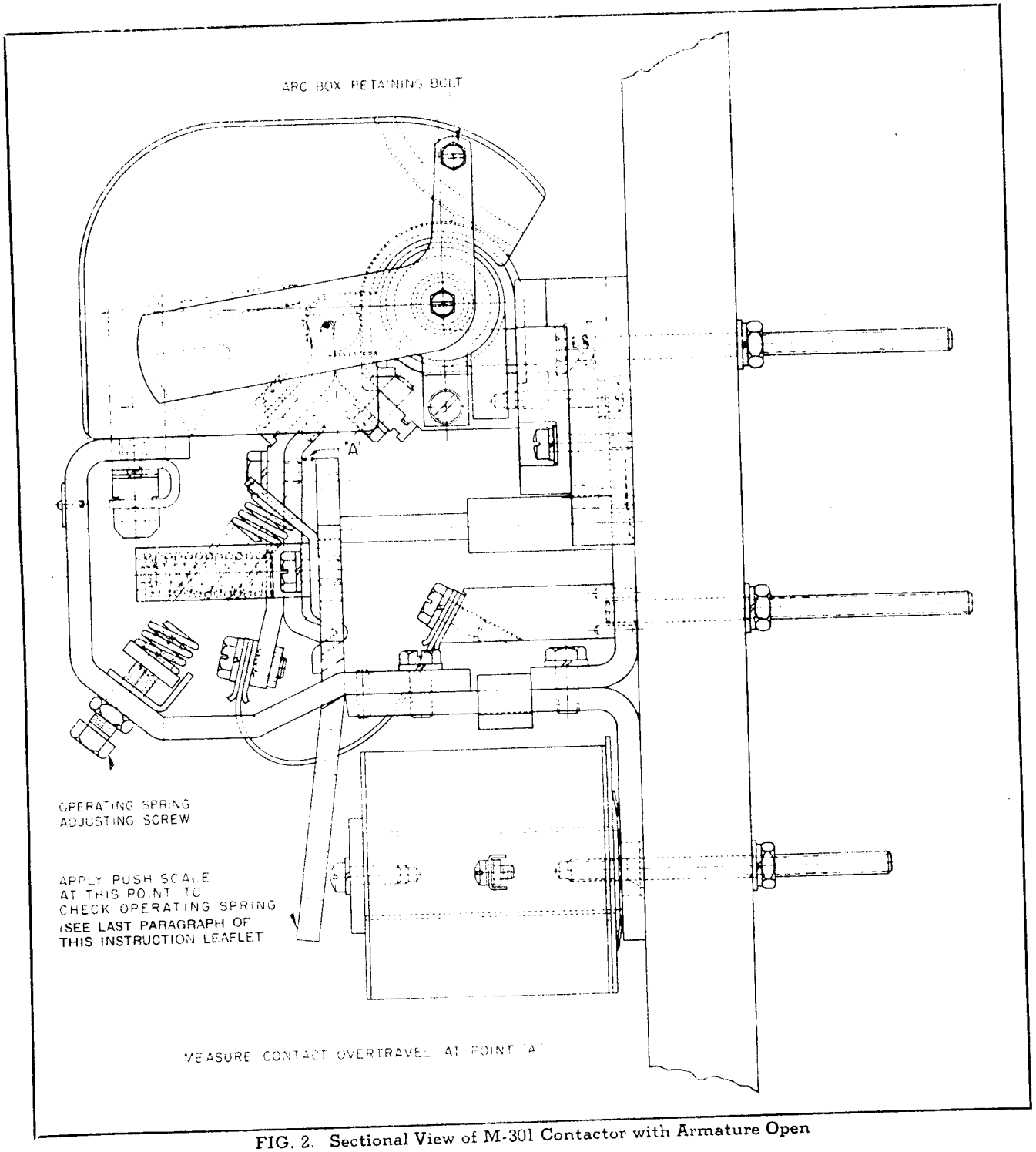

FIG. 2. Sectional View of M-301 Contactor with Armature Open

OPERATION

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The contactors are suitable for mounting only on insulating panels, up to 3 inches thick. As the frame is of the same potential as the moving contact, special insulating precautions must be taken if a contactor is to be mounted on a conducting surface.

Arc Shield. The arc shield and its arc horn are essential to the performance of the contactor and these parts should always be in place. The arc shield should always be pushed down so that it rests on the spring bracket. This insures proper engaging of the knife blade with the contactor switch jaws. The arc shield may be removed by first removing the arc box retaining bolt, which is located at the top of the L shaped side plates. Then raising the arc shield until the knife blade clears the stop bracket, pull the arc shield forward clear of the contactor.

In replacing the arc shield care must be taken that the pole piece plugs are aligned with the recesses in the arc shield walls to permit proper reassembly. The arc box retaining bolt is made of non-magnetic material. A steel bolt used in this location will short circuit the magnetic blow-out field and impair interruption of the arc.

Armature and Bearing. The knife edge bearing requires no maintenance. A shelf is provided on the armature plate to prevent falling dust and dirt collecting between the armature and frame. Oil should not be used at any point on this contactor.

On Types M-301, 401 and 501 the magnet pole face is secured to the core by means of a non-magnetic bolt having a head that projects forward into a hole in the armature. When properly assembled this bolt head is centered in the hole.

Operating Coil. When a new operating coil is installed the identification label should be examined to make certain that the voltage rating and the coil style number are correct for the application. The more commonly used operating coils are listed in Table No. 2.

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M-501	1419 552	1419 553	1754 376	1419 554
M-601 M-701	1419 564	1419 565	1754 336	1419 566

Contacts. Oil or other lubricants should not be used on the copper contacts. Filing and dressing the contacts is unnecessary.

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*Dimension "A" on Fig. 2

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The contact gap and spring forces, with new contacts, should be as shown in Table No. 3.

To measure the final contact force, close the contactor and by means of a spring scale hooked to a loop of fine wire around center line of moving contact, measure the force necessary to separate the contacts. Consideration must be given the diameter of the wire used in comparing values read with the tabulated values in this leaflet.

If after new contacts are installed, the forces are not correct, it may be necessary to replace the contact spring, or adjust the number of spring shims in the spring seat.

Failure of the magnet to close the contactor may result from an open circuited operating coil, from a circuit condition in which the voltage is low, from friction between parts, or from improper operating spring adjustment. After the contacts have worn considerably, readjustment of the operating spring forces may be necessary.

OPERATING SPRINGS

When the operating springs are properly adjusted a push scale applied 1/8" up from the bottom edge of the armature should read as follows to move the bottom of the armature.

M-301—M-401 ..... 3/4 pounds
M-501 ..... 1½ pounds
M-601—M-701 ..... 1¾ pounds

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