PARTS LIST
AND INSTRUCTIONS

NIAGARA

ELECTRO-PNEUMATIC FRICTION CLUTCH Type LI-D

The LI-D Clutch is a very simple, low inertia design with a minimum of parts and nothing to adjust or get out of order.

The friction-driven discs are carried on an internally splined, nichrome cast-iron hub that is free to slide on a steel splined hub. The latter, in turn is, splined to the driveshaft. In this design long hub parts, relatively small in diameter, insure a minimum of rotating inertia while providing adequate bearing area to carry the high torque loads without perceptible back lash and subsequent wear.

Driving parts consist of a drive ring with an aluminum air cylinder attached by means of through studs. A diaphragm is carried inside of the cylinder that also retains the air pressure. The friction-driven discs are gripped between pressure plate and drive ring plate to engage the clutch.

TORQUE AND OVERLOAD

An adjustable friction clutch can be useful in protecting dies and presses from damage caused by overloads. However since damage is done by pressure or tonnage overloads, while an adjustable clutch responds only to torque overloads, it is necessary to understand the relationship of pressure or tonnage loads to torque loads at various positions of the press stroke.

At mid-stroke, where the effective crank arm or eccentric throw is at a maximum, maximum torque is required to produce a given pressure or tonnage. As the slide or ram descends from mid-stroke, the effective crank arm progressively decreases so that progressively less torque is required to produce the same given tonnage. Stated another way, a given constant torque will produce progressively higher pressures as the slide descends from mid-stroke. Consequently, a torque setting to protect against a pressure overload higher up on the stroke will produce a pressure overload further down on the stroke because mechanical advantage increases as the crank or eccentric approaches bottom dead center.

As bottom stroke is approached, the effective crank arm approaches zero, no friction clutch can provide absolute protection against bottom stroke overloads. It is apparent, therefore, that even at the clutch rated *torque* load a *tonnage* overload can occur at or near bottom stroke.

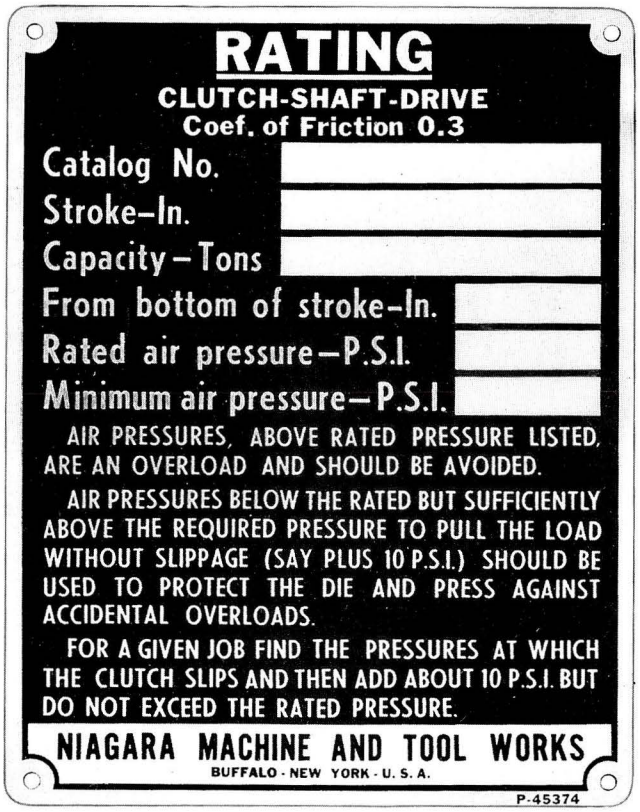

FIG. 1

To avoid overload, the required tonnage for each job should be calculated to make sure that it falls within the rated tonnage of the press. When using forming dies or dies which confine the work in metal to metal contact at bottom stroke, it should be remembered that it may require from 50 to 150 tons per square inch of surface area to squeeze down metal thickness. When this tonnage area ratio exceeds the press capacity, no thinning of the work will be accomplished, rather the press will be overloaded and sprung apart proportional to the amount that the shut height adjustment setting exceeds the metal-to-metal setting. Further downward adjustment beyond metal-to-metal setting results only in greater overload. Since enormous overloads can result from improperly adjusted bottoming dies, careful attention to die setting is important.

ADJUSTMENT FOR TORQUE LOADS

The output torque of the friction clutch can be varied by varying the air pressure applied to the clutch. To vary the air pressure to the clutch, a pressure regulator and a pressure gage are supplied.

For minimum clutch air pressure and rated air pressure refer to the clutch rating plate attached to your press. A replica of the clutch rating plate is shown in Fig. 1.

ADJUSTMENT FOR WEAR

No clutch adjustment is necessary to compensate for wear. Difference in plate travel with new friction plates, as opposed to plate travel with worn plates, is only a fraction of an inch, and the plates automatically compensate for wear. Engagement is instantaneous in either case.

MAINTENANCE

The clutch is outboard-mounted for accessibility and easy maintenance. Inspection and maintenance can be accomplished without disturbing the drive. Complete clutch disassembly can be made without removing flywheel, driveshaft or gears.

The diaphragm, if damaged, can be detected by the leakage of air through the driving ring vent holes. Replace the diaphragm by removing the retaining nuts which secure the cylinder to the clutch driving ring. Then remove the cylinder, rotary seal and diaphragm together. The cylinder and associated parts should be cleaned before assembly.

Because of the extremely rapid clutch engagement and the absence of slipping, there is normally very little wear of the clutch friction surfaces. However, after long service, when the surfaces become worn or grease-soaked, to the point where they do not pull the full rated load of the press, the discs can be replaced very easily. First remove the air cylinder assembly and outer clutch pressure plate. The friction discs can be slipped off the splined driving hub and new discs inserted.

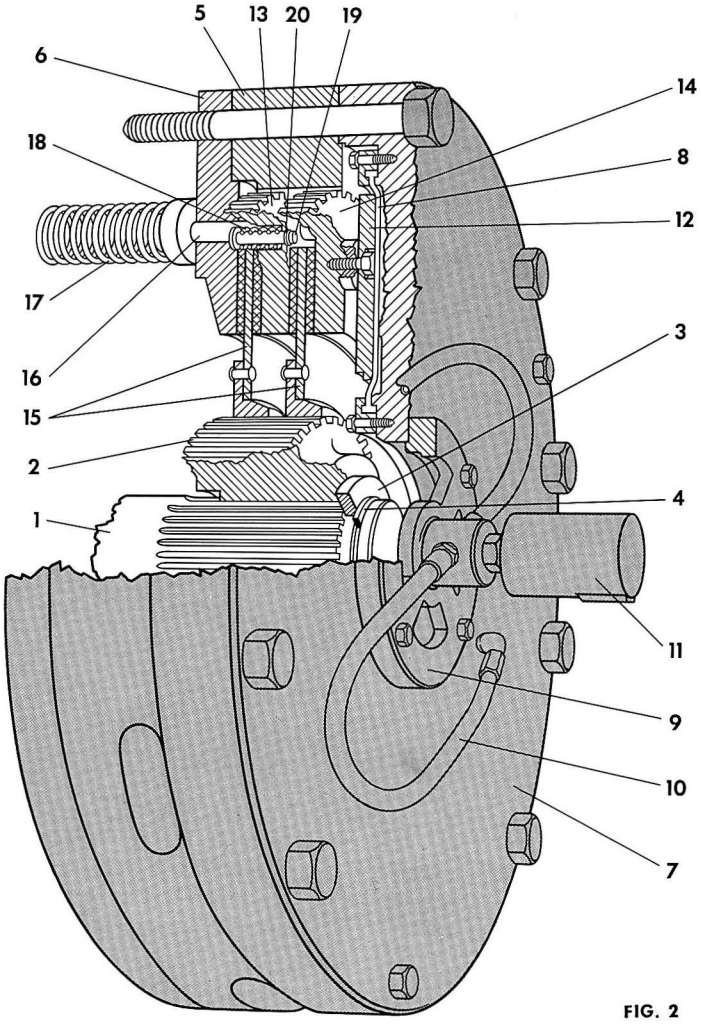

FIG. 2

PARTS LIST

1. Drive Shaft
2. Driving Hub
3. Driving Hub Retaining Ring
4. Clutch Snap Ring
5. Clutch Housing
6. Flywheel Insert
7. Clutch Cylinder
8. Diaphragm
9. Rotary Air Seal Adapter
10. Adapter Tubing
11. Rotary Air Seal
12. Pressure Plate
*13. Inner Pressure Plate
14. Outer Pressure Plate
*15. Friction Discs
16. Spring Plunger
17. Spreader Spring
*18. Separator Spring
*19. Spring Pin
*20. Snap Ring

* Single Plate Clutch has one driving friction disc (Part No. 15) and does not contain Part Nos. 13, 18, 19 and 20.

NOTE:

Since numbers on this parts list are for reference only and may be duplicated on other parts lists, specify part required by giving reference number and full part name, followed by Form A-6-E.

REPAIRS

When ordering repairs, always state the catalog number of the press and the factory serial number.

NIAGARA MACHINE & TOOL WORKS

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