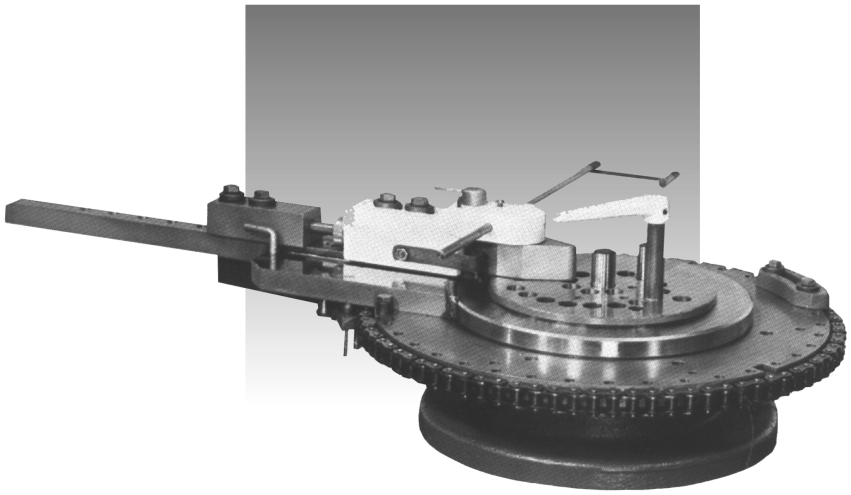
OPERATOR'S MANUAL & INSTRUCTIONS

NUMBER 4 Di-Acro Hand Bender



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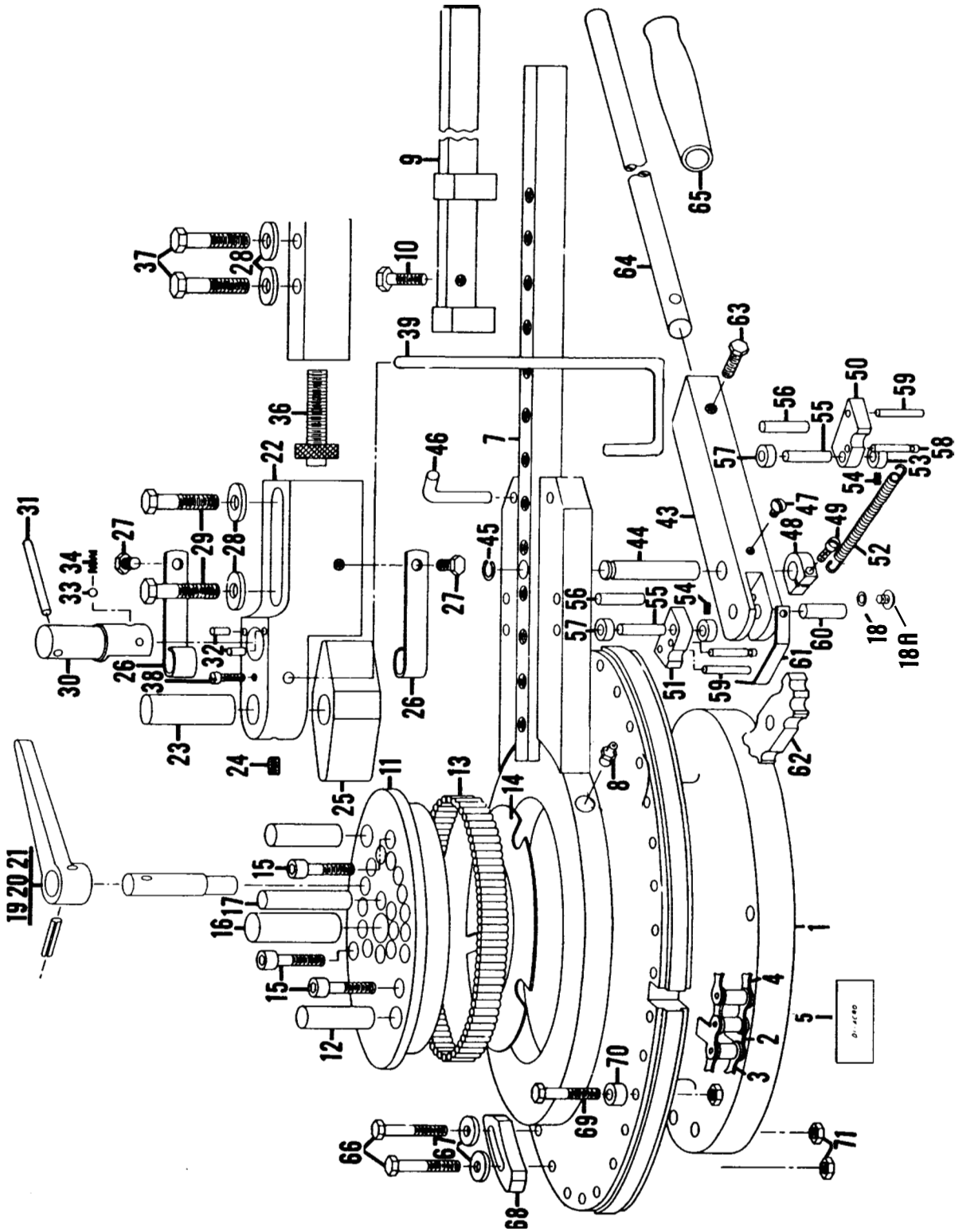
Revised 01/02

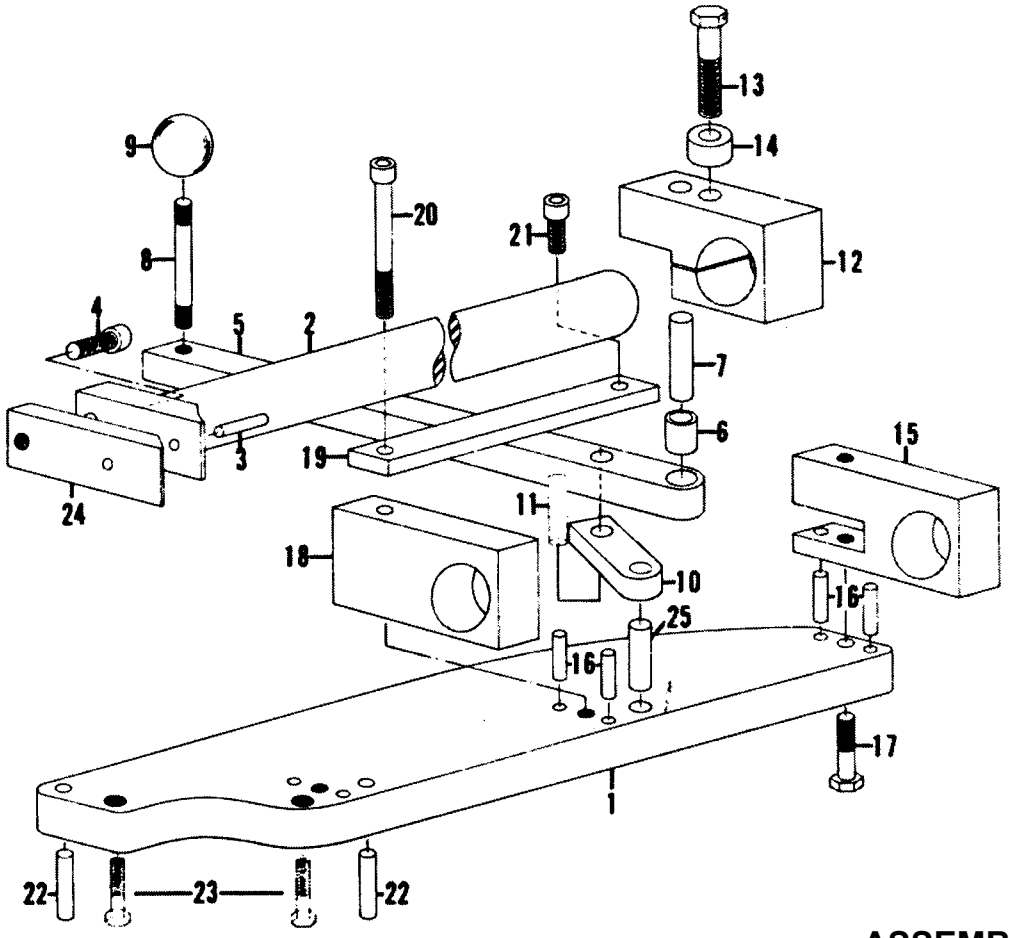
NO. 4 DI-ACRO BENDER
ASSEMBLY 8140800-080



#4 BENDER PARTS

ITEM	DESCRIPTION	PART NUMBER	QTY
1	BASE	8140110-100	1
2	PIN LINK ATTACHMENT	8430200-200	2
3	ROLLER CHAIN	8430100-100	1
4	ROLLER CHAIN	8430100-200	1
5	NAME PLATE		1
7	HANDLE ARM WLDMT	8140120-800	1
8	GREASE FITTING	8901004-000	1
9	ARM WLDMT EXTENSION	8130120-801	1
10	SCREW	21A0516C1104	1
11	MOUNTING PLATE	8140110-501	1
12	PIN	8140120-301	2
13	ROLLER	8310300-200	109
14	SHIM	8130570-203	6
15	SCREW	20A0308C1102	3
16	RADIUS PIN	8130016-970	1
17	PIN	8158120-302	1
18	WASHER	61X0104	1
18A	SCREW	20B0104F0102	1
19	LOCKING PIN ASSEMBLY “A” (3/4”)	8158111-370	1
20	LOCKING PIN ASSEMBLY “B” (15/16”)	8000111-370	1
21	LOCKING PIN ASSEMBLY “C” (1-1/16”)	8100111-370	1
22	NOSE HOLDER	8200121-701	1
23	NOSE PIN	8000120-301	1
24	SCREW	23A0308C0102	1
25	FORMING NOSE	8130121-701	1
26	NOSE SPRING	8120510-401	2
27	SCREW	21A0516C0102	2
28	WASHER	61X0102	4
29	SCREW	21A0102F2102	2
30	TRIGGER	8158121-702	1
31	TRIGGER PIN	8012200-000	1
32	NEEDLE ROLLER	8310301-200	2
33	STEEL BALL	8010461-000	1
34	SPRING	8120510-202	1
35	NOSE HOLDER SUPPORT	8158121-701	1
36	NOSE HOLDER SUPPORT SCREW	8300121-701	1
37	SCREW	21A0102F2102	2
38	SCREW	22B0104C0508	1
39	BEND LOCATING GAUGE	0144352-100	1
43	RATCHET HANDLE HOLDER	8140121-803	1
44	RATCHET HANDLE PIN	8140120-303	1
45	PIN CLIP	8140470-605	1
46	RATCHET HANDLE STOP PIN	8140120-304	2
47	SCREW	20B0104C0516	3
48	COLLAR	8000121-803	1
49	SOCKET HEAD CAP SCREW	20A0104C1104	1
50	CHECK PAWL R	8000121-804	1
51	CHECK PAWL L	8100121-804	1
52	SPRING	8510100-100	1
53	COLLAR	8200121-804	2
54	SCREW	23A0104C0104	2
55	PIN	19A0308X2102	2
56	PIN	19A0308X1308	2
57	CHECK PAWL SPACER	8500121-804	2
58	CHECK PAWL SPRING STOP	8300121-804	2
59	CHECK PAWL HANDLE	8010596-000	2
60	RATCHET PAWL PIN	8000120-304	1
61	RATCHET PAWL SPRING	8140510-405	1
62	RATCHET PAWL	8140121-804	1
63	SCREW	21A0516C0304	1
64	EXTENSION ARM	8200120-800	1
65	GRIP	8120810-100	1
66	SCREW	21A0308C2102	2
67	WASHER	61X0102	2
68	ANGLE GAUGE	8120142-001	1
69	SCREW	21A0308C2104	1
70	RETURN STOP	8100142-001	1
71	NUT	30X0308C	3

#4 BENDER
QUIK-LOK ASSEMBLY



ASSEMBLY
8146111-373

CAUTION

TO PREVENT SERIOUS BODILY INJURY AND DAMAGE TO THE MACHINE

BOLT THE MACHINE TO THE STAND AND THE STAND TO THE FLOOR

THE ART OF BENDING

FOR A COMPLETE DESCRIPTION OF 20 BENDING OPERATIONS WITH CLEAR STEP-BY-STEP ILLUSTRATIONS OF EACH, ORDER THE 20-PAGE DI-ACRO “ART OF BENDING” CATALOG WITH OVER 90 DIAGRAMS AND CHARTS TOGETHER WITH VALUABLE TOOLING SUGGESTIONS.

#4 BENDER QUIK-LOK PARTS

ITEM	DESCRIPTION	PART NUMBER	QTY
1	BASE	8146111-300	1
2	SLIDE WLDMT	8700111-300	1
3	PIN	19A0104X1000	1
4	SCREW	20A0308C0304	1
5	HANDLE ARM	8146110-700	1
6	BEARING	8310410-900	1
7	PIN	19A0102X1304	1
8	STUD BOLT	8100470-102	1
9	PLASTIC KNOB	8120810-600	1
10	LINK	8800111-300	1
11	PIN	19A0102X1104	1
12	CLAMP	8146111-301	1
13	SCREW	21A0102F2102	1
14	SPACER A	8100111-301	1
15	HANGER ASSY OUTER	8146111-370	1
16	PIN	19A0516X1000	4
17	SCREW	21A0308C1102	1
18	HANGER ASSY INNER	8200111-370	1
19	SUPPORT BAR	8000111-301	1
20	SCREW	21A0308C3102	1
21	SCREW	21A0308C1000	1
22	PIN	19A0308X2000	2
23	SCREW	21A0102C1304	2
24	CLAMP BLOCK	8200111-301	1
25	PIN	19A0102X1102	1

SPECIFICATIONS

	No. 1A		No. 2		No. 3		No. 4	
Model	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**
Max. Radius Capacity	6	152.4	9	228.6	12	304.8	12	304.8
Height of Standard Forming Nose	3/4	19.1	1	25.4	1-1/2	38.1	1-1/2	38.1
Center Pin Hole—Diameter	1/2	12.7	1	25.4	1	25.4	1	25.4
Operating Leverage	16	406.4	29	736.6	40	1016	40	1016
Material Capacities								
Round Mild Steel Bar	5/16	7.9	1/2	12.7	5/8	15.9	1	25.4
Square Mild Steel Bar	1/4	6.4	3/8	9.5	1/2	12.7	3/4	19.1
Steel Tubing—16 gauge	1/2	12.7	3/4	19.1	1	25.4	1-1/4	31.8
Standard Iron Pipe	—	—	3/8 IPS	9.5	1/2 IPS	12.7	1 IPS	25.4
Flat Steel Bar (easy way)	3/16 x 1,4.8 x 25.4		1/4 x 1-1/2,6.4 x 38.1		1/4 x 2,6.4 x 50.8		3/8 x 4,9.5 x 101.6	
Flat Steel Bar (hard way)	1/8 x 1/2,3.2 x 12.7		1/8 x 3/4,3.2 x 19.1		1/8 x 1,3.2 x 25.4		1/4 x 1,6.4 x 25.4	

RATCHET OPERATION

For clockwise operation of the Di-Acro Bender No. 4, engage check pawl B, disengage check pawl C, remove stop pin F from hole D and place in hole E. For counter-clockwise operation, engage check pawl C, disengage check pawl B and place stop pin F in hole D.

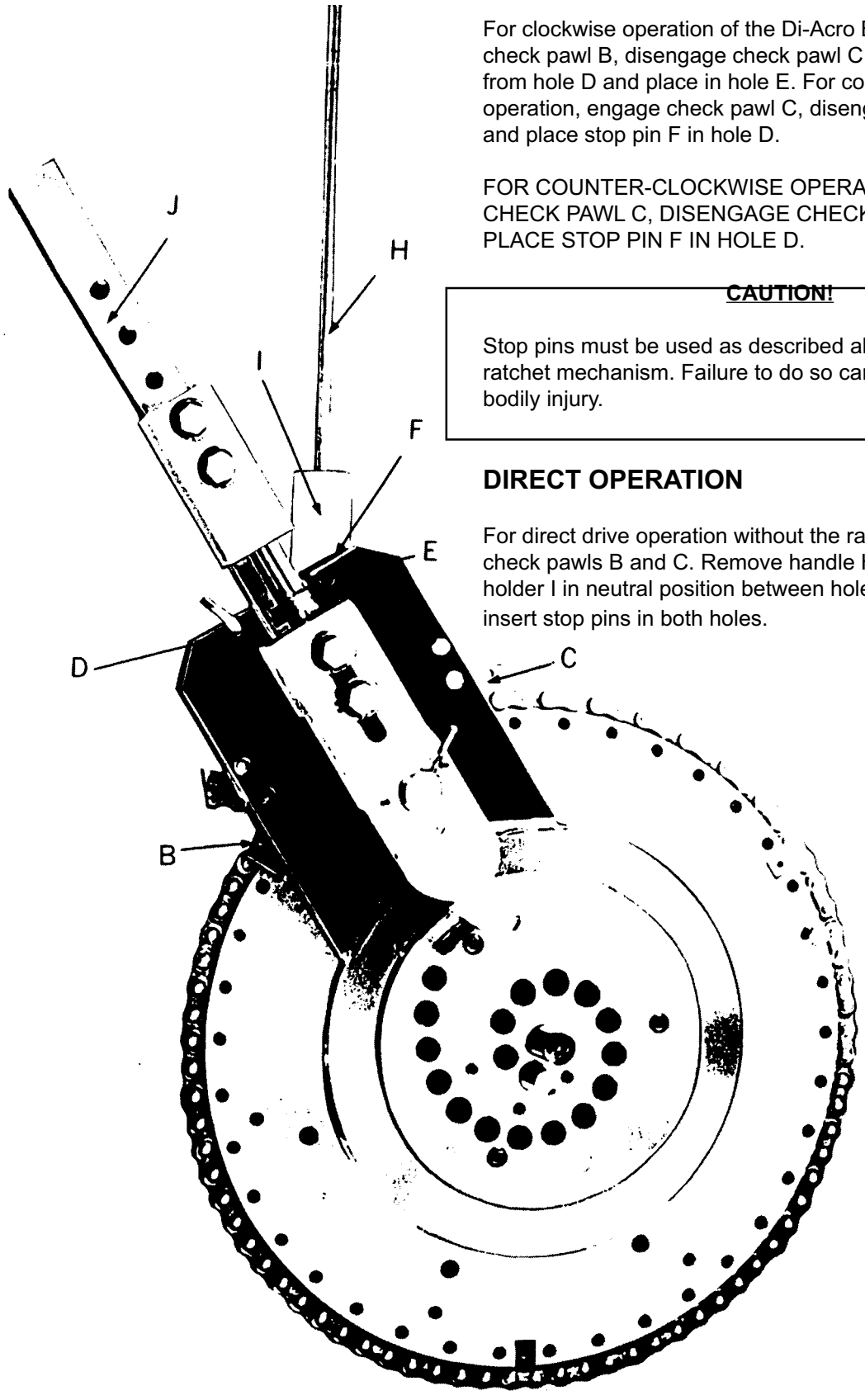
FOR COUNTER-CLOCKWISE OPERATION, ENGAGE CHECK PAWL C, DISENGAGE CHECK PAWL B AND PLACE STOP PIN F IN HOLE D.

CAUTION!

Stop pins must be used as described above when using the ratchet mechanism. Failure to do so can result in serious bodily injury.

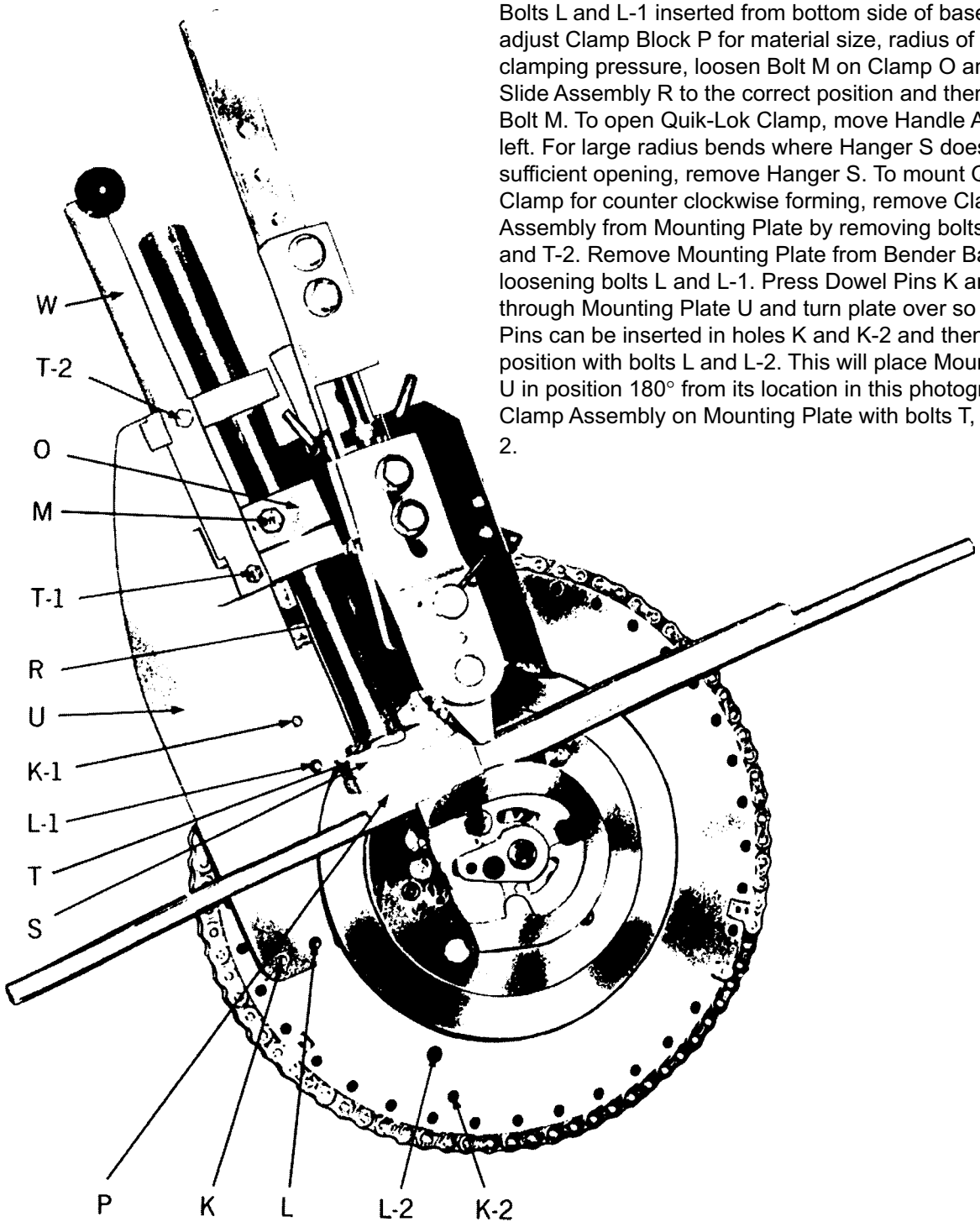
DIRECT OPERATION

For direct drive operation without the ratchet, disengage both check pawls B and C. Remove handle H, place handle holder I in neutral position between holes D and E, and insert stop pins in both holes.



Instructions for mounting Quik-Lok Clamp

To mount Quik-Lok Clamp on Di-Acro Bender No. 4 for clockwise forming, insert Dowel Pins K and K-1 in holes provided in Bender base casting and bolt in position width Bolts L and L-1 inserted from bottom side of base. To adjust Clamp Block P for material size, radius of bend, and clamping pressure, loosen Bolt M on Clamp O and move Slide Assembly R to the correct position and then tighten Bolt M. To open Quik-Lok Clamp, move Handle Arm W to left. For large radius bends where Hanger S does not allow sufficient opening, remove Hanger S. To mount Quik-Lok Clamp for counter clockwise forming, remove Clamp Assembly from Mounting Plate by removing bolts T, T-1 and T-2. Remove Mounting Plate from Bender Base by loosening bolts L and L-1. Press Dowel Pins K and K-1 through Mounting Plate U and turn plate over so Dowel Pins can be inserted in holes K and K-2 and then bolt in position with bolts L and L-2. This will place Mounting Plate U in position 180° from its location in this photograph Bolt Clamp Assembly on Mounting Plate with bolts T, T-1 and T-2.



BENDER TOOLING

SPECIAL TOOLING FOR YOUR SPECIAL BENDING NEEDS

When you have a bending problem in production or design, Di-Acro can aid you at no obligation. Just send blueprints, dimensioned sketches, or the part you wish to produce to our Applications Engineering Department and your plans will receive prompt attention.
Special tooling? Here is some tooling we have available: Crush-bend tooling, automatic follow-bar return, wiper dies and ball mandrels for thin-walled tight radius tube bending, power clamping for high speed application, pneumatic mandrel extractor.

SPRING BACK - When determining the size of the Radius Pin or Collar, spring-back should be compensated for. A frequent way is by overbending slightly beyond the required angle. After the amount of spring-back has been determined, the Angle Gauge can be set so that all bends will be duplicated. In addition to overbending, it may be necessary, in some cases, to form the material around a Radius Pin or Radius Collar of smaller radius than the desired bend. The actual size of th Radius Pin or Collar can best be determined by experiment for the material and conditions.

FORMING ROLLER - To eliminate work marking and reduce operator effort, it is often desirable to replace the Forming Nose (furnished as standard equipment), with a Forming Roller.

BUILT-UP FORMING NOSE - This is used to increase the material width range of Di-Acro Benders. Must be used with wider or stacked radius collars.

There are two tube bending methods:
1. The "Forming Roller" method is recommended for (a) all large bends where centerline radius is at least 4 times the outside diameter (O.D.) of the tube, (b) pipe and heavy wall tubing, and (c) very small diameter tubing.
2. The "Follow Block" method, which allows forming thin wall tubing to a centerline radius as small as 2-1/2 times the O.D. without using inside madrels or fillers.

Guard against spring-back (see above). To prevent the tube form slipping during forming, the Quik-Lok Clamp is recommended, used with Type A Radius Collar. For locking smaller size tubing the Clevis and Swivel Clamps with Type B Radius Collars are used on No. 1 and No. 1A Benders.

PARTS REQUIRED FOR "FORMING ROLLER" BENDING METHOD Grooved Radius Collar - one for every radius and tube size. Grooved Forming Roller - one for each tube size only. Clamp Block - for use with Quik-Lok Clamp on all Di-Acro Benders. One for each tube size. Swivel and Clevis Clamps - for No. 1 and No. 1A Benders. One for each tube size.

PARTS REQUIRED FOR "FOLLOW-BLOCK" BENDING METHOD Grooved Radius Collar - one for every radius and tube size. Forming Roller - one covers all "Follow Block" operations. Follow Block - one for each tube size only. Listed length will accommodate a 180 degree bend. Clamp Block - for use with Quik-Lok Clamp on all Di-Acro Benders. One for each tube size. Swivel and Clevis Clamps - for No. 1 and No. 1A Benders. One for each tube size. Style B collars only.

IT'S EASY TO BEND

Increased knowledge of the cold bending of metal and improvements in bending machines during the past decade have opened new horizons in the manufacturing field as many forming operations not considered practical some years ago can now be readily performed.

Technically metal bending is rather involved due to the physical change that occurs within the material during the bending operation and also because the numerous types of alloys available each react differently when formed.

Rather that discuss these technical problems, the purpose of this booklet is to illustrate and describe the multitude of bending operations that can easily be accomplished without special engineering knowledge provided a few elementary principles are observed.

PRODUCT DESIGN

Design of the formed parts in a product generally determines whether or not they can be efficiently and economically produced. Give careful consideration to these suggestions.

Selection of material is of first importance as it must be sufficiently ductile to produce a satisfactory bend of the smallest radius required and still be strong enough to provide the rigidity which the product demands.

It is usually desirable to designate the largest practical radius as this gives wider latitude in choice of material and often assures a better bend in both strength and appearance.

By using the same size material and designating identical radii for each bend whenever possible, the tooling of the bending machine can be simplified and the highest possible production obtained as a number of successive bends can then be progressively made in a part, thereby completing it before it is removed form the machine.

Compound bends or adjacent bends in different planes should be avoided if possible because of confliction that may occur between the bends which might necessitate special tooling. This is especially true in tubing but also holds for solid materials.

Generally the smallest recommended radius for tubing, measured to the exact center of the tube, is 1-1/2 times the outside diameter of the tube provided an inside mandrel is used when bending. This minimum centerline radius should be increased to at least 2-1/2 times the outside diameter of the tube if the bend is to be made without an inside madrel.

In making a bend near the end of a tube, a straight length equal to at least the diameter of the tube should extend beyond the bend. If a bend is required to the very end of the tube, a straight length should be allowed and trimmed after forming.

SELECTION OF MATERIAL

From the numerous types of material available in tubing, extrusions, mouldings, channel and solid bars, the most suitabel material for produciton of a part can usually be chosen.

In making this selection the ductility of the material should be given prime consideration and before a decison is made a sample should be formed to the smallest required radius or assurance obtained from the supplier that the bend can be satisfactorily made.

Elasticity of the material, which causes it to spring back after it has been bent, must also be considered as it may be impossible to form a closed eye or a complete circle is some alloys.

If tubing is to be bent without an inside mandrel the heaviest practical wall should be used. As a rule, in non-ferrous metals, one quarter to half hard tubing provides best results.

When bending channels, angles, mouldings, and extrusions the centerline radius of the bend should usually be at least three times the width of the flange to be formed edgewise.

CHOICE OF BENDING MACHINE

A number of bending machines are offered on the market today and your choice of the most suitable bender can largely be determined by the range of your bending requirements.

These machines are available in both small and large manually operated models as well as power driven units; some designed for one specific application and otheres capable of performing a wide variety of operations.

Should your work consist only of one specialized operation such as the bending of thin wall tubing on a high speed basis, obviously a completely automatic bender is the answer.

If, on the other hand, your jobs are so varied that you are called on to form a variety of materials such as tubing, angle, channel, extrusions, mouldings, and bus bars in addition to solid materials, a universal all-purpose bender will best serve your needs.

Oftentimes small parts can be formed faster and cheaper with manually operated benders provided production quantities do not warrant completely automatic equipment.

Careful study of specifications, capacities and working range of the various benders under consideration will enable you to choose the most logical unit for your own operations.

TOOLING THE BENDER

All bending machines merely provide a means of applying power either manually or mechanically to perform the bending operation and supply mountings for the bending tools.

These tools consist of a form or radius collar having the same shape as the desired bend, a clamping block or locking pin that securely grips the material during the bending operation and a forming roller or follow block which moves around the bending form.

When bending materials of open cross section such as tubing, channel, angle and extrusions, the bending form should exactly fit the contour of the material to provide support during ther forming operation. This is also true of the clamping block and forming roller, as only by completely confining the material can a perfect bend be obtained.

Since all metals are somewhat elastic, they will spring back more or less after they are formed and for that reason the bending form must usually have a smaller radius than the required bend. The amount of springback is dependent upon the type of material, its size and hardness, as well as the radius of the bend and it is usually necessary to experiment somewhat to determine the exact size of the bending form.

Bending is no different than any machining operation in that the results obtained will be in direct proportion to the care taken in properly tooling the bender for the job to be done.