

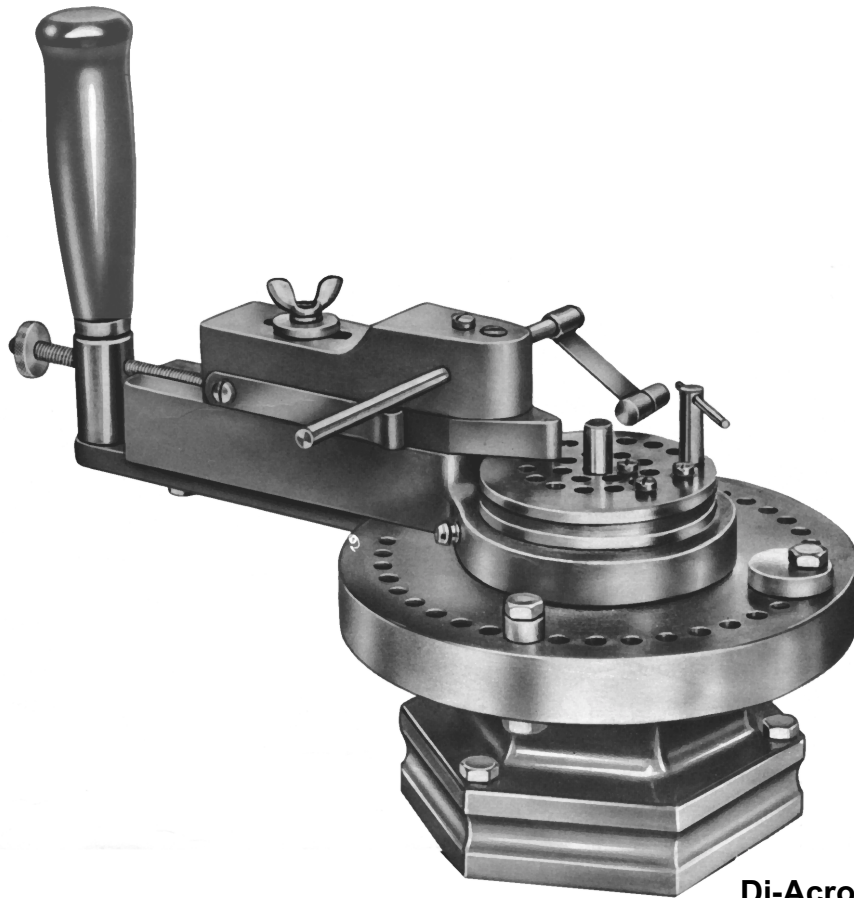
Di-Acro[®]

OPERATOR'S MANUAL & INSTRUCTIONS

NUMBER 1

Di-Acro

Hand Bender



Di-Acro, Incorporated
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Revised 02/02

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We are proud to re-introduce the #1 Bender, which we affectionately call “Junior.” Although, the #1 Bender is the “midget” of the Di-Acro Bender Family, this precision machine is a high-speed production unit for all materials within its range. Small parts can often be formed at rates in excess of 750 bends per hour. Weighing only 22 pounds, it has a material capacity of 3/16” round steel bar and 5/16” diameter steel tubing. Its radius capacity is 2”.

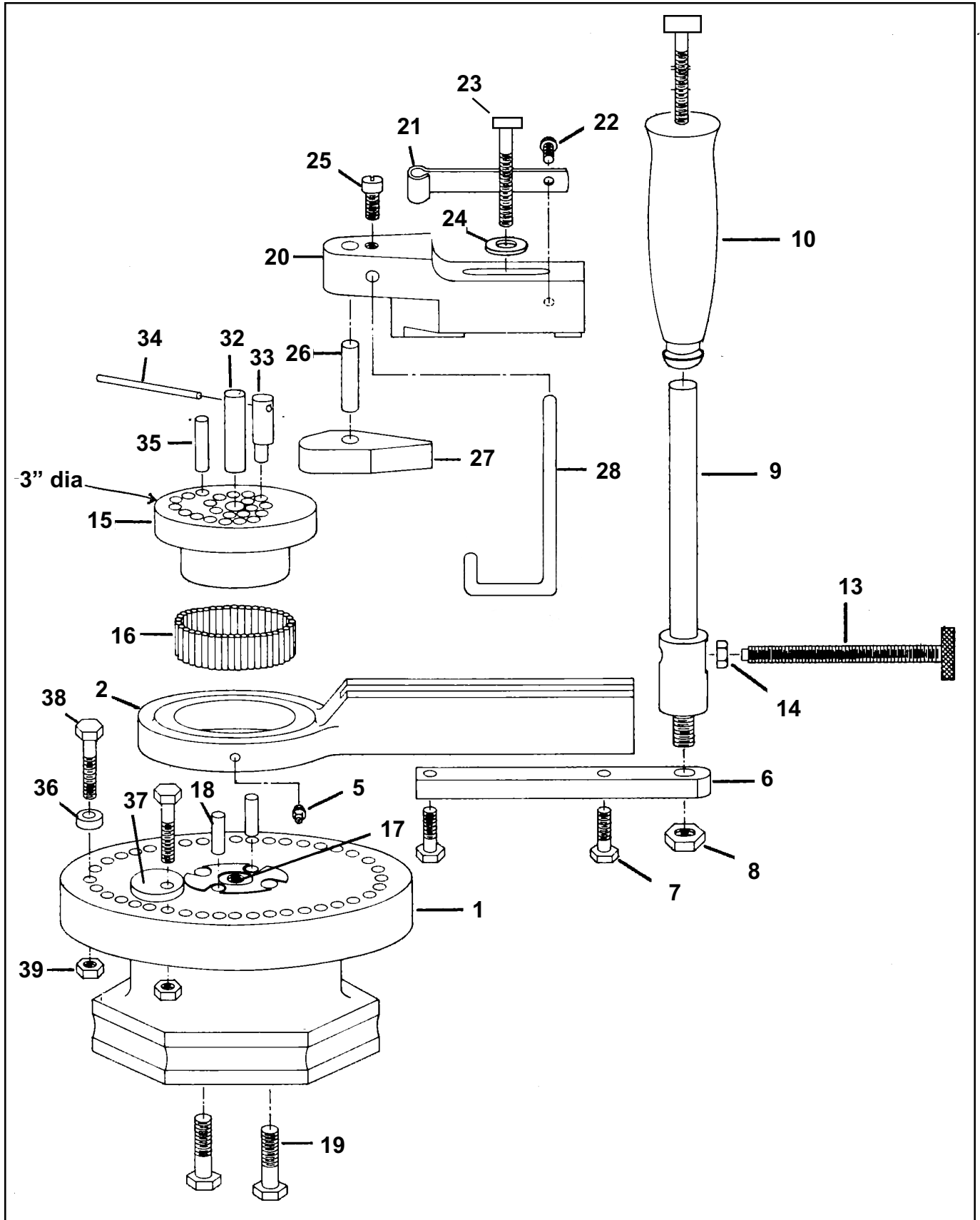
SPECIFICATIONS

Radius Capacity	2”
Height of Standard Forming Nose	1/2”
Built-Up Nose	1”
Center Hole Dia.	3/8”
Operating Leverage	8”
Weight	22 lbs.

MATERIAL CAPABILITIES

Round Mild Steel Bar	3/16”
Square Mild Steel	1/8”
Steel Tubing	5/16”
Flat Steel Bar (Easy Way)	1/8” x 3/4”
Flat Steel Bar (Hard Way)	1/16” x 1/2”
Angle	1/16” x 1/2” x 1/2”
Channel	1/16” x 1/4” x 1/2”

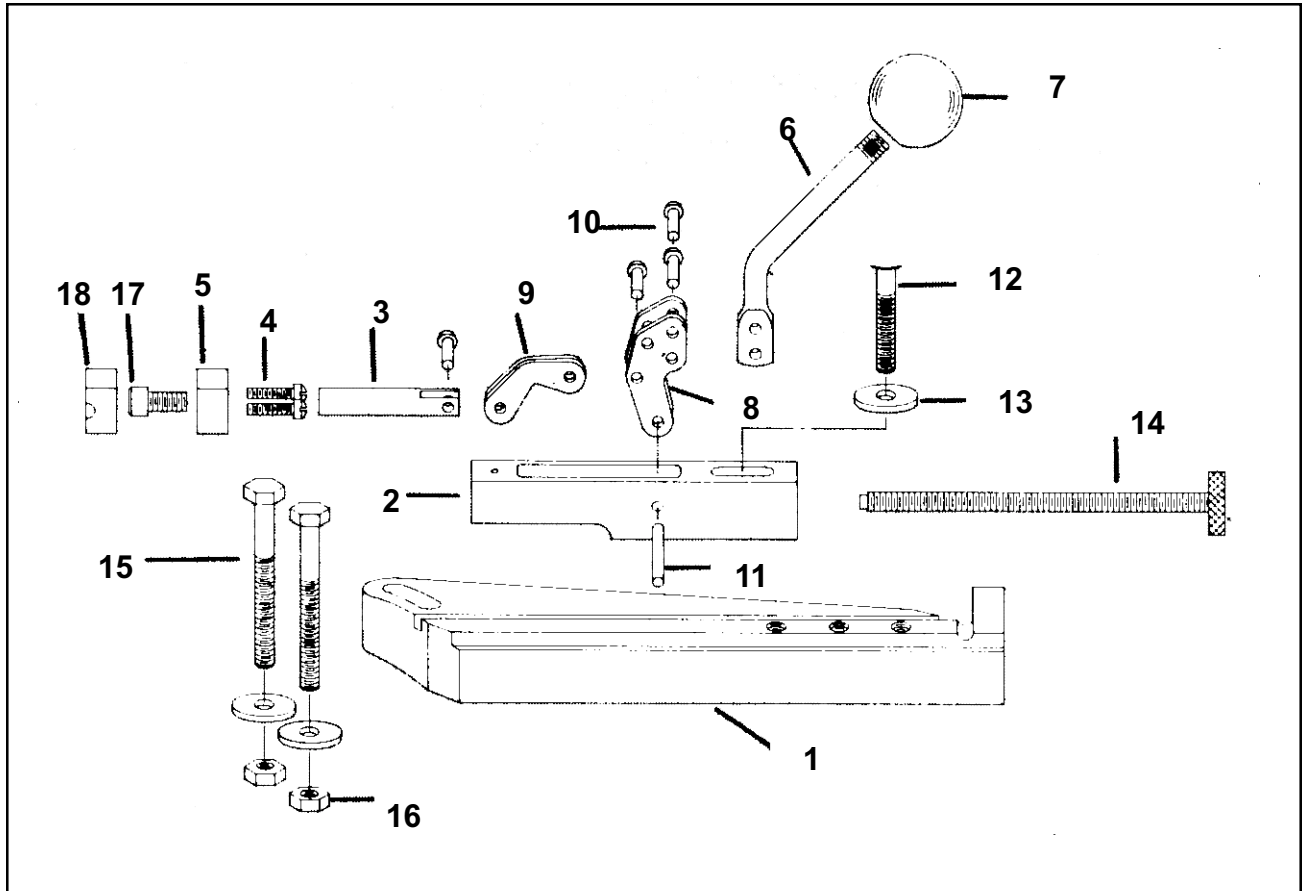
#1 BENDER



#1 BENDER

Item No.	Description	Part No.	Qty
	BENDER NO. 1 COMPLETE	100-8000800	
1	Base	100-1101001	1
2	Paddle	100-1208002	1
5	Grease Fitting	6901002	1
6	Handle Arm	100-1208005	1
7	Screw	21A0104F0304	2
8	Nut	30X0308C	1
9	Handle Stud	100-4701007	1
10	Handle	8120811-400	1
13	Support Screw Assembly	100-1217023	1
14	Nut	31X0516C	1
15	Mounting Plate	100-1105011	1
16	Needle Bearings	3103001	57
17	Shims	100-5702038	6
18	Pin	3103002	2
19	Screw	21A05016C0304	2
20	Nose Holder	100-1217015	1
21	Nose Spring	100-5104014	1
22	Screw	22BX10F0102	1
23	Screw	21A0104F2000	1
24	Washer	61X0104	1
25	Screw	21A0104F0102	1
26	Nose Pin	100-1203017	1
27	Forming Nose	100-1217013	1
28	Bend Locating Gauge	0104352-100	1
32	Radius Pin	0010613-000	1
33	Locking Pin "A"	100-1203029	1
34	Locking Pin	100-1203028	1
35	Holding Pin	100-1203037	1
36	Return Stop	100-1410019	1
37	Angle Gauge	100-1420018	1
38	Screw	21A0104F1102	2
39	Nut	31X0104F	2

QUIK-LOK



QUIK-LOK

Item No.	Description	Part No.	Qty.
	QUIK-LOK COMPLETE	106-1113801	
1	Base	106-1113001	1
2	Hanger A	116-1113021	1
3	Slide Arm	116-1113003	1
4	Screw	22BX10F0508	2
5	Nose	116-1113006	1
6	Handle Arm	116-1113007	1
7	Plastic Knob	1208106	1
8	Handle Link	1113124	2
9	Link	1113125	1
10	Rivet	4703101	4
11	Pin	19A0316X1104	1
12	Screw	25X0104F1304	1
13	Washer	61X0104	3
14	Support Screw Assembly	100-1217023	1
15	Screw	21A0104F2102	2
16	Nut	30X0104F	2
17	Screw	20A0516C0508	1
18	Clamp Block	*	1
	Customer Choice — *		

CAUTION



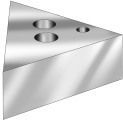
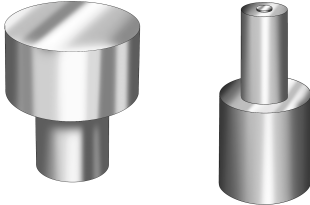
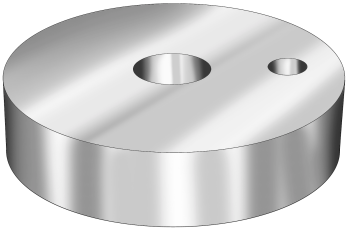
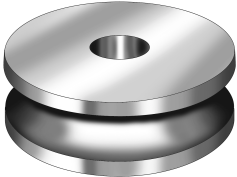
TO PREVENT SERIOUS BODILY INJURY
AND DAMAGE TO THE MACHINE

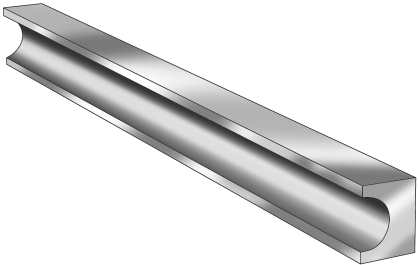
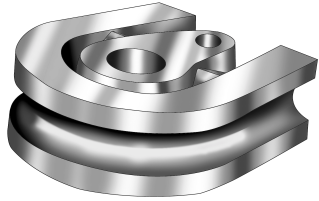
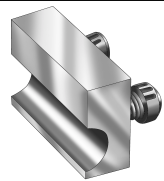
BOLT THE MACHINE TO THE STAND
AND THE STAND TO THE FLOOR



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 OF 90 DIAGRAMS AND CHARTS TOGETHER WITH VALUABLE TOOLING SUGGESTIONS.

DESCRIPTION	PART NUMBER	SIZE
BUILT-UP NOSE 	8100250-000	3" HT.
FORMING ROLLER 	8100690-000	3" DIA.
RADIUS BLOCK 	8100000-920 8100002-920 8100004-920 8100006-920	0" R. 1/16" R. 1/8" R. 3/16" R.
 RADIUS PIN	8100004-970 8100006-970 8100008-970 8100010-970 8100012-970 8100014-970 8100016-970 8100018-970 8100020-970 8100022-970 8100024-970 8100026-970 8100028-970	1/8" R. 3/16" R. 1/4" R. 5/16" R. 3/8" R. 7/16" R. 1/2" R. 9/16" R. 5/8" R. 11/16" R. 3/4" R. 13/16" R. 7/8" R.
 RADIUS COLLAR	8100030-930 8100100-930 8100102-930 8100104-930 8100106-930 8100108-930 8100110-930 8100112-930 8100114-930 8100116-930 8100118-930 8100120-930 8100122-930 8100124-930 8100126-930 8100128-930 8100130-930 8100200-930	15/16" R. 1" R. 1-1/16" R. 1-1/8" R. 1-3/16" R. 1-1/4" R. 1-5/16" R. 1-3/8" R. 1-7/16" R. 1-1/2" R. 1-9/16" R. 1-5/8" R. 1-11/16" R. 1-3/4" R. 1-13/16" R. 1-7/8" R. 1-15/16" R. 2" R.
 GROOVED ROLLER	8100012-790 8100014-790 8100016-790 8100020-790 8100024-790 8100008-790 8100012-790	TUBE DIA. 3/8" 7/16" 1/2" 5/8" 3/4" 1/4" I.P.S. 3/8" I.P.S.

DESCRIPTION	PART NUMBER	SIZE	
 <p style="text-align: center;">FOLLOW BLOCK</p>	8106012-622	LENGTH 6"	TUBE DIA. 3/8"
	8106012-623	9"	3/8"
	8106012-624	12"	3/8"
	8106014-622	6"	7/16"
	8106014-623	9"	7/16"
	8106014-624	12"	7/16"
	8106016-622	6"	1/2"
	8106016-623	9"	1/2"
	8106016-624	12"	1/2"
	8106020-622	6"	5/8"
	8106020-624	12"	5/8"
	8106020-625	15"	5/8"
	8106024-623	9"	3/4"
	8106024-624	12"	3/4"
	8106024-625	15"	3/4"
	8106008-622	6"	1/4" I.P.S.
	8106008-623	9"	1/4" I.P.S.
	8106008-624	12"	1/4" I.P.S.
	8106012-622	6"	3/8" I.P.S.
	8106012-623	12"	3/8" I.P.S.
8106012-625	15"	3/8" I.P.S.	
 <p style="text-align: center;">GROOVED RADIUS COLLAR STYLE A (USE WITH QUIK-LOK CLAMP)</p>	8106100-012	C/L RADIUS 1"	TUBE DIA. 3/8"
	8106200-012	2"	3/8"
	8106300-012	3"	3/8"
	8106104-014	1-1/8"	7/16"
	8106200-014	2"	7/16"
	8106300-014	3"	7/16"
	8106108-016	1-1/4"	1/2"
	8106200-016	2"	1/2"
	8106300-016	3"	1/2"
	8106124-020	1-3/4"	5/8"
	8106300-020	3"	5/8"
	8106400-020	4"	5/8"
	8106200-024	2"	3/4"
	8106300-024	3"	3/4"
	8106400-024	4"	3/4"
	8106116-008	1-1/2"	1/4" I.P.S.
	8106200-008	2"	1/4" I.P.S.
	8106300-008	3"	1/4" I.P.S.
	8106124-012	1-3/4"	3/8" I.P.S.
	8106300-012	3"	3/8" I.P.S.
8106400-012	4"	3/8" I.P.S.	
 <p style="text-align: center;">CLAMP BLOCK (USE WITH QUIK-LOK CLAMP)</p>	8100012-320	TUBE DIA. 3/8"	
	8100014-320	7/16"	
	8100016-320	1/2"	
	8100020-320	5/8"	
	8100024-320	3/4"	
	8100008-320	1/4" I.P.S.	
	8100012-320	3/8" I.P.S.	

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 the 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 mandrels or fillers.

Guard against spring-back (see above). To prevent the tube from 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 than 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 from 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 mandrel.

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 suitable material for production of a part can usually be chosen.

In making this selection the ductility of the material should be given prime consideration and before a decision 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 in 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 edge-wise.

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 others 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 their 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.