

FIG. 1

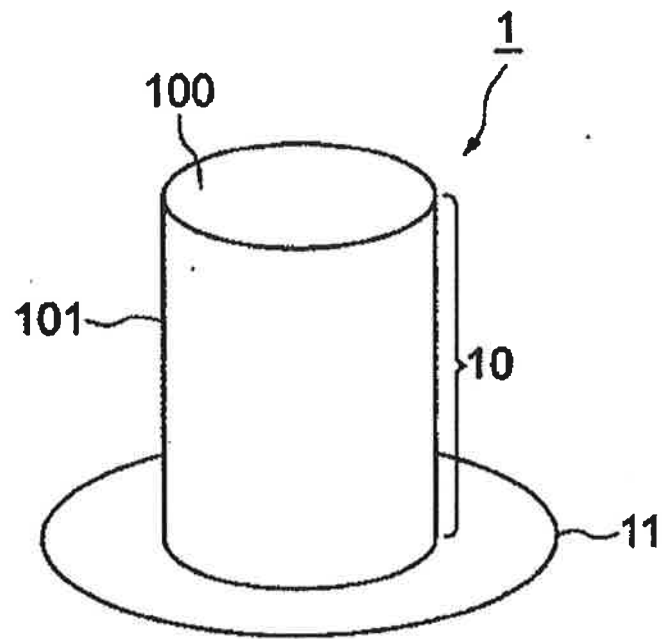


FIG. 2

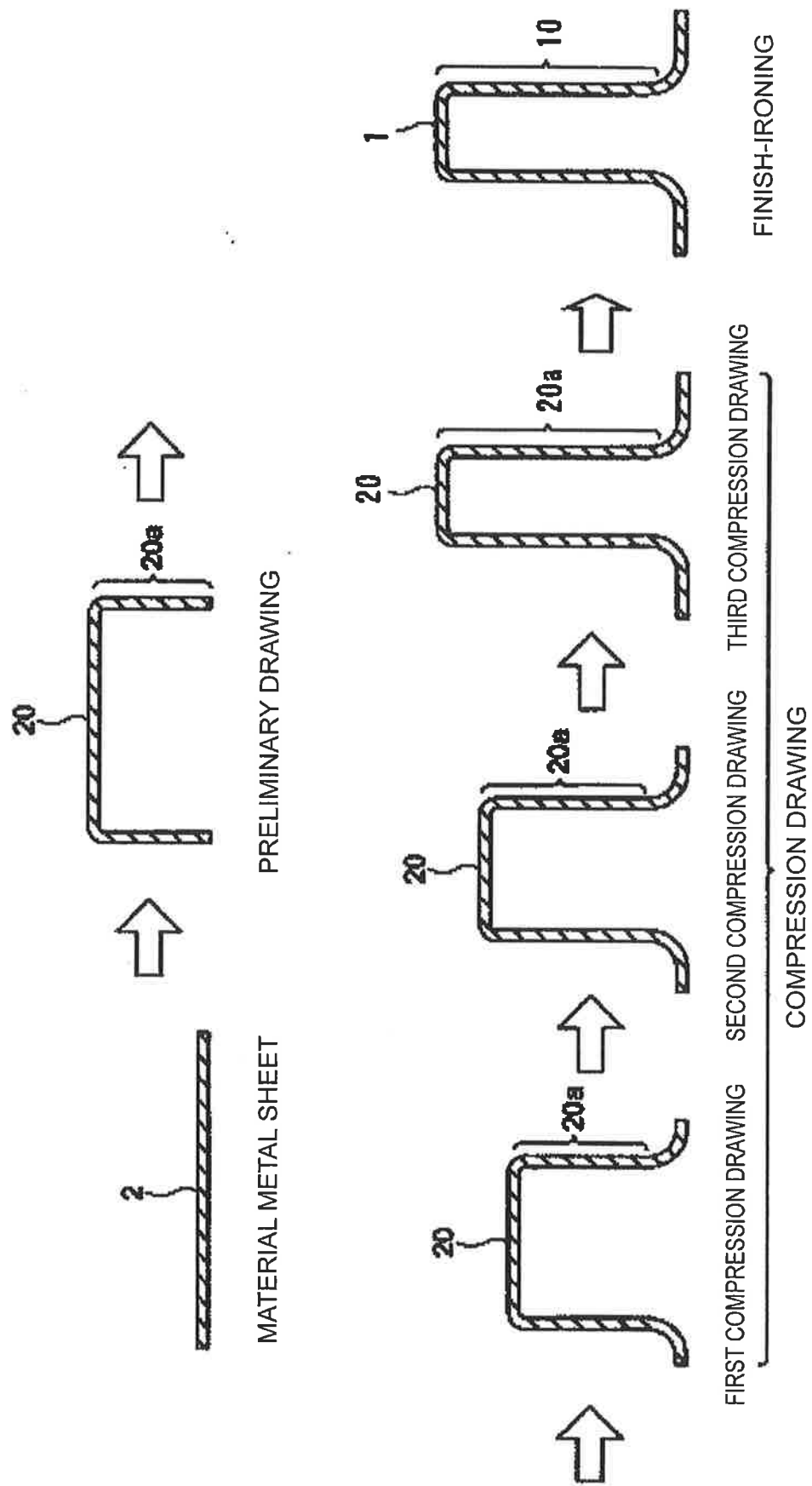


FIG. 3

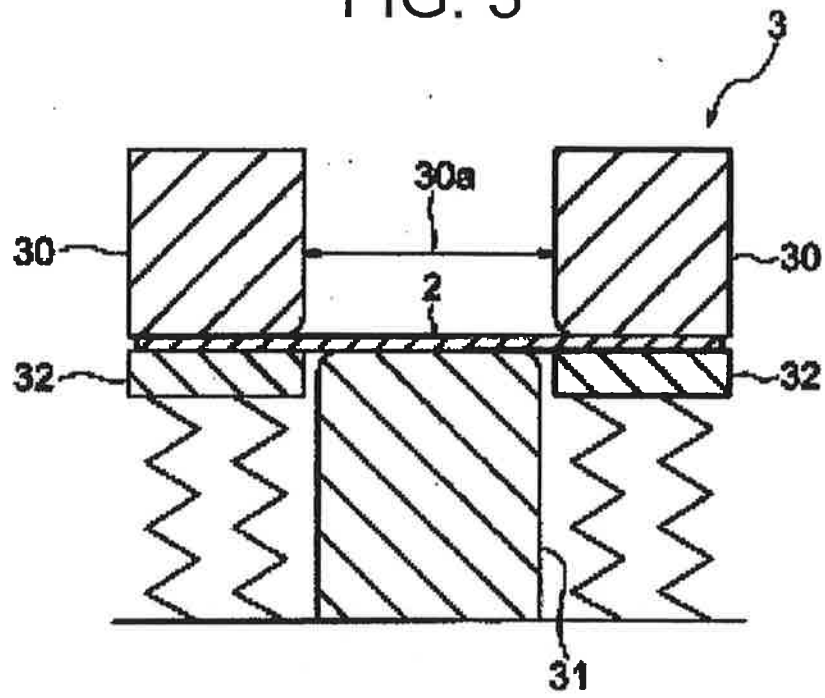


FIG. 4

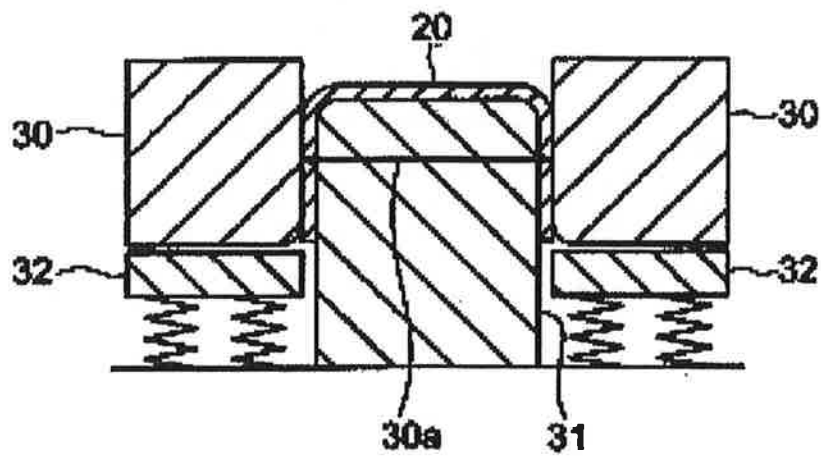


FIG. 5

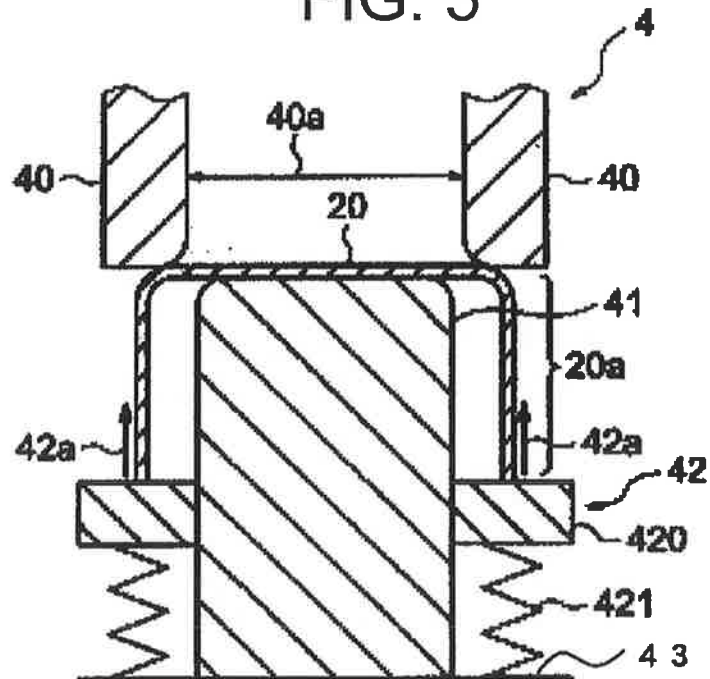


FIG. 6

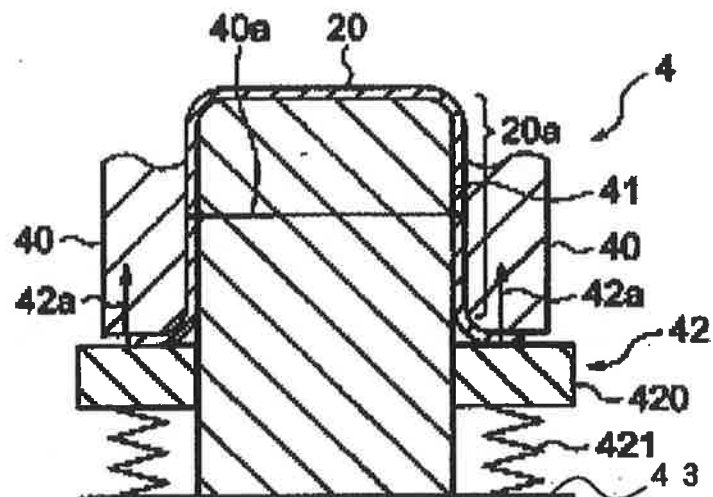


FIG. 7

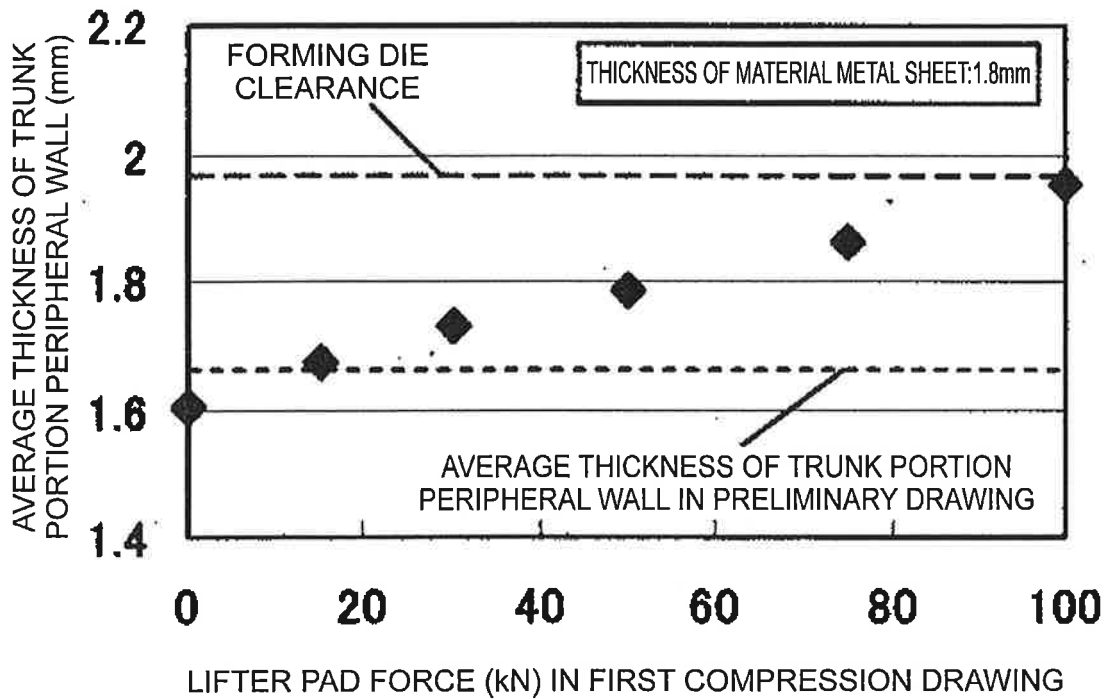


FIG. 8

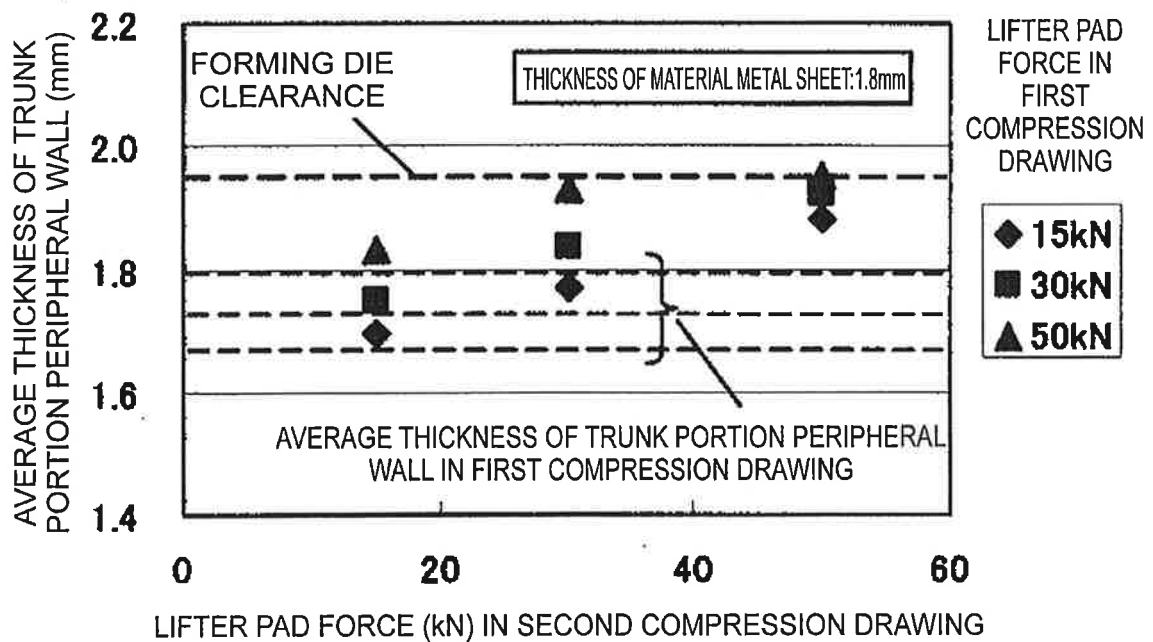


FIG. 9

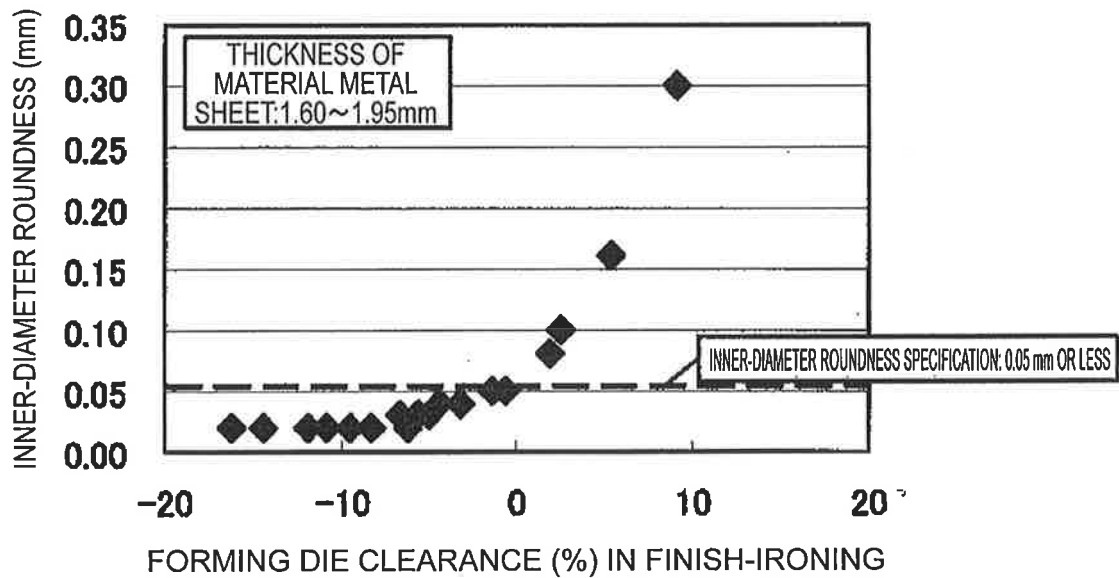


FIG. 10

ORDINARY WALL THINNING (COMPARATIVE EXAMPLE 1)					
THICKNESS OF MATERIAL METAL SHEET (mm)	THICKNESS BEFORE FINISH-IRONING (mm)	CLEARANCE (%) IN FINISH-IRONING	ROUNDNESS (mm)	PLATING RESIDUE	EVALUATION
1.60	1.42	9.2	0.30	NONE	×
1.65	1.47	5.4	0.16	NONE	×
1.70	1.51	2.6	0.10	NONE	×
1.75	1.56	-0.6	0.05	NONE	○
1.80	1.60	-3.1	0.04	NONE	○
1.85	1.64	-5.5	0.03	NONE	○
1.90	1.69	-8.3	0.02	NONE	○
1.95	1.74	-10.9	0.02	YES	×

DIE SHOULDER RADIUS IN FINISH-IRONING: 1.8mm

FIG. 11

BOTTOMING WALL THICKENING (COMPARATIVE EXAMPLE 2)					
THICKNESS OF MATERIAL METAL SHEET (mm)	THICKNESS BEFORE FINISH-IRONING (mm)	CLEARANCE (%) IN FINISH-IRONING	ROUNDNESS (mm)	PLATING RESIDUE	EVALUATION
1.60	1.52	2.0	0.08	NONE	×
1.65	1.57	-1.3	0.05	NONE	○
1.70	1.62	-4.3	0.04	NONE	○
1.75	1.66	-6.6	0.03	NONE	○
1.80	1.71	-9.4	0.02	NONE	○
1.85	1.76	-11.9	0.02	YES	×
1.90	1.81	-14.4	0.02	YES	×
1.95	1.85	-16.2	0.02	YES	×

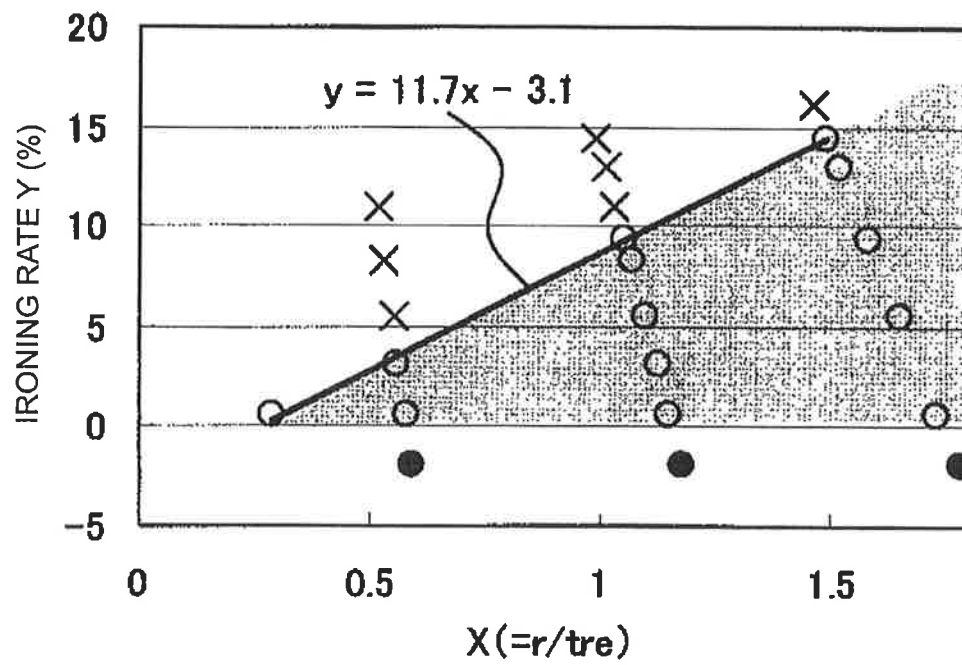
DIE SHOULDER RADIUS IN FINISH-IRONING:1.8mm

FIG. 12

WALL THICKENING CONTROLLED BY LIFTER FORCE (EXAMPLE OF THE PRESENT INVENTION)						
THICKNESS OF MATERIAL METAL SHEET (mm)	THICKNESS BEFORE FINISH-IRONING (mm)	CLEARANCE (%) IN FINISH-IRONING	ROUNDNESS (mm)	PLATING RESIDUE	EVALUATION	LIFTER PAD FORCE
1.60	1.65	-6.1	0.03	NONE	○	APPLIED
1.65	1.63	-4.9	0.03	NONE	○	APPLIED
1.70	1.63	-4.9	0.03	NONE	○	APPLIED
1.75	1.63	-4.9	0.04	NONE	○	APPLIED
1.80	1.60	-3.1	0.03	NONE	○	NOT USED
1.85	1.64	-5.5	0.02	NONE	○	NOT USED
1.90	1.69	-8.3	0.02	NONE	○	NOT USED
1.95	1.74	-10.9	0.02	YES	×	NOT USED

DIE SHOULDER RADIUS IN FINISH-IRONING:1.8mm

FIG. 13



DIE SHOULDER RADIUS IN FINISH-IRONING: 0.45mm~2.7mm

FIG. 14

