

Jan. 9, 1968

F. W. BRODERICK

3,362,264

PROCESS FOR REGISTER EMBOSSING PRINTED SHEET METAL

Filed March 22, 1965

FIG- 1

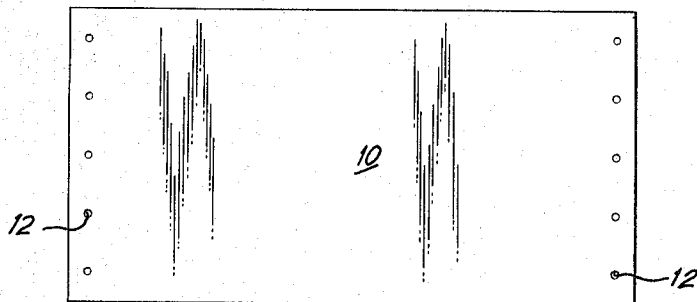


FIG- 2

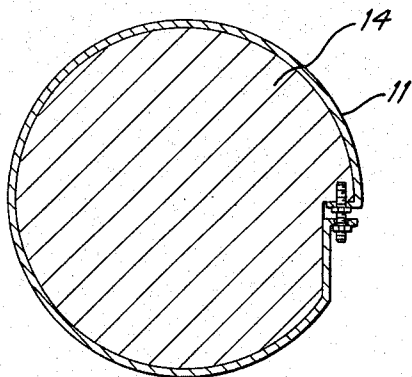


FIG- 3

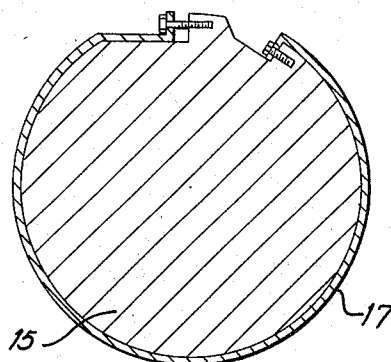
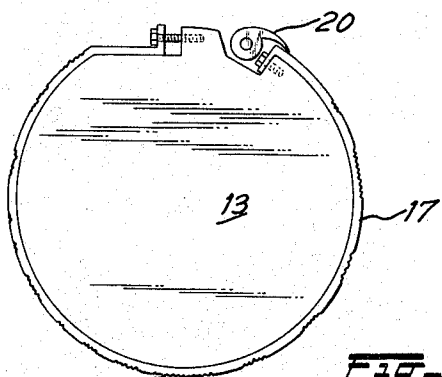


FIG- 4

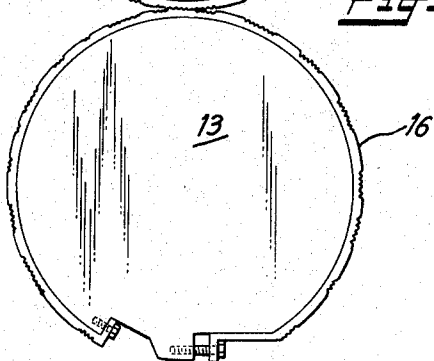


FIG- 5

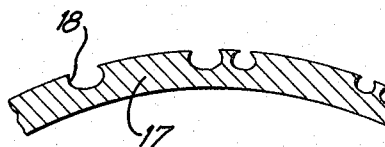
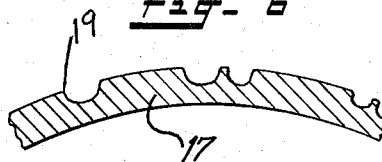


FIG- 6



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PROCESS FOR REGISTER EMBOSSED PRINTED SHEET METAL

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Filed Mar. 22, 1965, Ser. No. 441,828
2 Claims. (Cl. 76—107)

ABSTRACT OF THE DISCLOSURE

This invention comprises the provision of a process for the preparation of a pair of engraved jackets adapted for embossing sheet material wherein the female jacket is ground to a thickness diameter which registers with the printing diameter of cylinders at the printing press station and the male jacket is ground to an outside diameter computed as the female diameter plus twice the height of the desired embossing protuberances. The jackets are otherwise prepared by use of conventional engraving, flame hardening, etching and like procedures.

This invention relates to continuous rotary register embossing of printed sheet metal and more particularly to the provision of a mated set of embossing jackets for the embossing rolls thereof. The jackets are metal plates of suitable thickness adapted to conform to the cylindrical co-acting rolls as in conventional printing presses.

Various attempts have been made to emboss printed sheet metal in such a manner that the embossing would register to predetermined parts of printed sheet metal to give pleasing and highly reflective results. However, all of the processes developed to date are either too expensive or they do not have sufficiently durable physical properties to permit their use in production. Matched hardened forged steel rolls have been developed for rotary web register embossing but sheet metal such as is used for tin or aluminum cans is printed in sheet form, thus making such rolls impractical.

The object of this invention is to utilize two cylinders co-acting together as in conventional cylinder printing presses and to equip such cylinders with hardened steel jackets in such a manner that they will form a male and female cylinder combination geared together to register emboss the pre-printed sheet metal.

This invention is illustrated in the embodiment shown in the accompanying drawing in which;

FIG. 1 is a front view of a sheet of metal to be formed into an embossing jacket,

FIG. 2 is a view of a formed jacket disposed on a mandrel ready for heat hardening.

FIG. 3 shows the manner of securing the male and the female jacket to a corresponding press roll,

FIG. 4 shows a pair of mated jacketed embossing rolls disposed in operative relationship,

FIG. 5 shows a portion of an embossed female jacket showing the undercutting conventionally obtained when acid etching is employed, and

FIG. 6 is a like portion of an embossed female jacket showing cavities having machine engraved contours.

Turning to the drawing, a steel metal sheet 10 of .020 to .100 inch thick and having alloy properties capable of being hardened to a Rockwell C-40 to C-60 range is cut to the desired size, FIG. 1. This sheet is formed and bent to provide a jacket 11 that fits accurately to the cylinders of a sheet fed rotary press. All bends and apertures 12 used to attach the jackets 11 to press cylinders 13 are accurately located and the cylinders are adapted in such a manner that the jackets may be drawn taut over the surface of said press cylinders.

After the provision of the press cylinder specifications, the soft jacket is attached to a master low carbon cylinder

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or roll 14 having about the contour and shape of the production press cylinder. However, the jacket is not overstressed by use of excessive tautness. The jacket 11 is then flame hardened to the desired physical properties. By this method both the upper and the lower, namely, the male and the female jackets are hardened to contour. After hardening the jackets are locked on mandrels 15 that duplicate the production press cylinders 13 to which they will be attached for production and are then ground to finish tolerance. Both the male jacket 16 and female jacket 17 are prepared in this manner. The female jacket is ground to a thickness diameter that registers to the printing diameter plates of the preceding press station and the male jacket is ground to an outside diameter computed as the female diameter plus twice the height of the desired embossing. Thus, if the female jacket is ground to 10.100 inches diameter and the male embossing is .005 inch high, the outside diameter of the mating male jacketed cylinder is ground to 10.110 inches.

The jacketed female roll (FIG. 3) is then photo engraved. Embossing art work is prepared as a separate overlay over black and white art having indicated color separations. The register markings on the black and white art for the printing are the same for the embossing and are repeated on the embossing register overlay. When the step and repeat figures and procedures are determined for the printing color cylinders, the same step and repeat figures and procedures are used to photo-compose the production embossing separation from the embossing art overlay. After the embossing separation positive is completed, the ground hardened steel jacket on its mandrel is sensitized with conventional photo resist such as Eastman Kodak Photo-Resist or else a conventional carbon tissue laydown may be made on the jacket. When the jacket is sensitized with photo-resist, the embossing positive is placed in direct contact with the sensitized jacket and then exposed to ultra violet lights. The jacket is then developed, dyed, retouched and etched.

Where carbon tissue procedure is used no direct sensitizing of the jacket is necessary. The gelatin of the tissue is the sensitized agent and etching is in accordance with the adherence of the tissue to the jacket. These above described procedures are conventional means of intaglio photo engraving.

In many cases since photo engraving produces cavities 18 having sharp edges and under-cut depths (FIG. 5) it is desirable to machine engrave the female jacket to produce cavities 19 having rounded contours. In such instances, the female jacket is ground and left soft, a register image is photo etched into the soft jacket by a register positive in the same manner as for the hardening jacket described above. A die and mill for machine engraving are prepared to register into the photo engraved positions on the soft jacket and the rounded contours are machine engraved into the desired photo engraved etched images. After the photo and machine engraving procedure, the jacket is finally hardened as described hereinabove. After both the engraving and the hardening steps, the jacketed male and female cylinders are placed into press position wherein both jacketed cylinders are very accurately geared together (FIG. 4).

The cylinders are then coated with a waxy acid resist and brought together under pressure. The female engraved jacket 17 functions as an intaglio print cylinder and leaves imprinted on the oversize unengraved male jacket an exact image of the female cylinder in wax resist. Where there are no cavities in the surface of the female cylinder, all resist is squeezed out and the metal of the ground steel jacket is exposed. The male jacket 16 attached to the cylinder is then etched. However, the images in resist being of wax do not etch and a mated male jacket results

after repeated etchings. Mating is complete when no resist is left on the male jacket when the two jacketed rolls are brought together under pressure.

Where pattern intricacies indicate the probability of excessive elongation during embossing, the male jacket may be overall etched to give a desired clearance of the male protuberances in the female cavities. Where some register of embossing to print may be given tolerance, the female jacket may also be etched for clearance.

In some cases the female jacket may be chrome plated from .001 to .005 inch before transfer mating to the male roll. Later the chrome is chemically removed from the female jacket after transfer mating to give larger and better controlled clearances. The jackets are then highly polished, removed from their manufacturing mandrel cylinders 15 and shipped to the final user where they are locked in register position on an equivalent production roll 13.

As shown in the drawing, FIG. 4, the press cylinder 13 may be provided with grippers 20 adapted for individual sheet feeding of pre-printed sheet metal sheets between the mated embossing jackets on their cylinders 13.

However, in the continuous embossing of continuous pre-printed stock on a combination printing and embossing machine, the grippers 20 are eliminated.

I claim:

1. The method of preparing a mated pair of rotary embossing jackets adapted to be secured to a respective rotary press cylinder in a printing-embossing machine comprising bending a pair of substantially rectangular metal sheets about respective cylinders in taut relationship to form a pair of embossing jacket blanks; heat hardening said jacket blanks; grinding said hardened jacket blanks to produce a female jacket blank of desired thickness and an overall diameter and a male jacket blank equal to that of the female blank plus twice the predetermined height of the embossing protuberances; photo-engraving followed by etching said female jacket blank to produce a female jacket; and resist coating followed

by an etching image transfer procedure onto said male jacket blank to produce a male jacket from said engraved female jacket whereby a pair of hardened mated male and female engraved embossing jackets of substantially cylindrical contour are adapted to be secured to respective press cylinder.

2. The method of preparing a mated pair of rotary engraved embossing jackets adapted to be secured to rotary press cylinders in a printing-embossing machine comprising bending a pair of substantially rectangular metal sheets about respective cylinders in taut relationship to form a pair of engraved jacket blanks; grinding one of said jacket blanks to produce a female jacket blank of desired thickness; photo-engraving followed by etching said female jacket blank; machine engraving followed by heat hardening said female jacket blank to produce a female jacket; heat hardening followed by grinding said male jacket blank to an overall diameter equal to that of the female jacket plus twice the predetermined height of the embossing protuberances and resist coating followed by an etching image transfer procedure onto said male jacket blank to produce a male engraved embossing jacket whereby a pair of mated hardened male and female engraved embossing jackets of substantially cylindrical contour are produced and are adapted to be secured to respective press cylinders.

References Cited

UNITED STATES PATENTS

30	905,708	12/1908	Ker	101—28
	1,050,411	1/1913	Wait	101—23
	1,130,515	3/1915	Howe	101—23
	2,662,002	12/1953	Sunderhauf et al.	76—107 X
35	2,887,042	5/1959	Broderick et al.	76—107 X
	3,022,231	2/1962	Broderick	76—107 X
	3,214,310	10/1965	Di Leo et al.	76—107 X

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