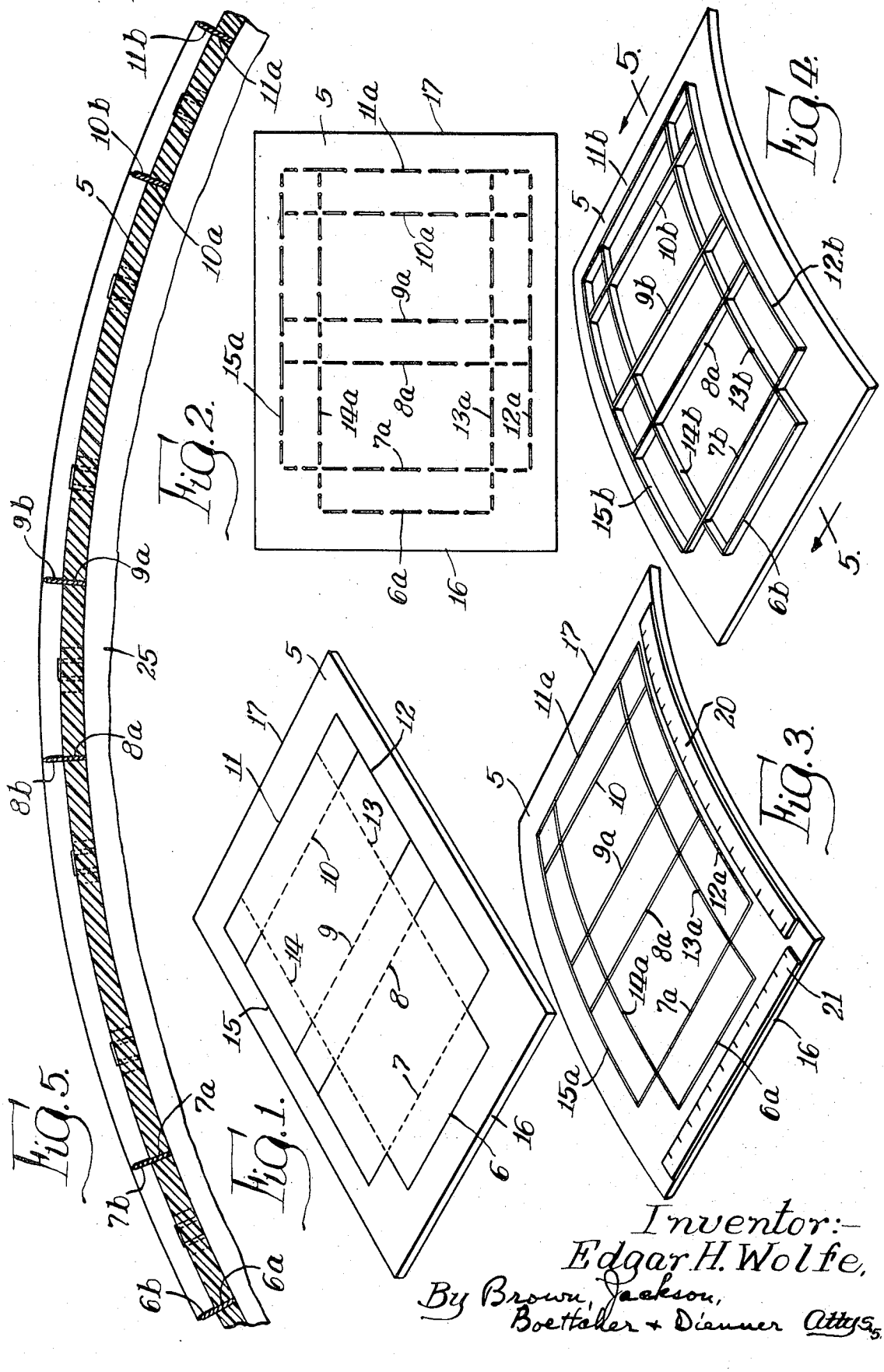
Feb. 23, 1971 E. H. WOLFE 3,564,942

METHOD OF FABRICATING STEEL RULE DIES.

Filed May 6, 1969



Inventor:-
Edgar H. Wolfe,
By Brown, Jackson,
Boettcher + Dienner Attys.

United States Patent Office 3,564,942 Patented Feb. 23, 1971

3,564,942

METHOD OF FABRICATING STEEL RULE DIES

Edgar H. Wolfe, Chicago, Ill., assignor to The Barrett Bindery Co., Chicago, Ill., a corporation of Illinois

Filed May 6, 1969, Ser. No. 822,134
Int. Cl. B21k 5/20
U.S. Cl. 76—107 2 Claims

ABSTRACT OF THE DISCLOSURE

A method of fabricating a curved steel rule die having a base member of predetermined curvature conforming to and for mounting on a rotatable cylinder with steel rules mounted in recesses in the base member having their outer working edges lying at a predetermined radius from the rotational axis of the cylinder, in which the base member is initially in a flat condition and while in flat condition a pattern is applied and recesses formed in the base member according to the pattern in a manner such that when the base member is curved to the predetermined curvature and steel rules inserted into the recesses, the working edges of the steel rules lie at the aforementioned predetermined radius from the center of the rotational axis of the cylinder.

BACKGROUND OF THE INVENTION

(1) Field of the invention

The present invention relates to methods of fabricating curved steel rule dies for mounting on the rotatable cylinder of a press, and in which the curved steel rule dies embody steel rules having outer working edges lying at a predetermined radius from the axis of rotation of the cylinder to provide desired operations such as cutting scoring, embossing and the like on material fed through the press.

(2) Description of the prior art

In my prior Pat. No. 3,322,004 dated May 30, 1967, there is disclosed a method of making a curved steel rule die requiring the following several steps. Initially a flat base member for the die is curved to correspond to the curvature of a cylinder for carrying the die and to which a pattern for steel rules for the die is then applied. Thereafter the curved base member is returned to a flat condition and suitable recesses are formed in the flat base member conforming to the inscribed pattern on the base member. Following formation of the recesses for the steel rules, the base member is then again curved to correspond to the curvature of the cylinder for carrying the die and the steel rules are then mounted into the recesses in the base member. According to this known method, a flat base member must be first curved, then flattened, and again curved in the fabrication of the die.

SUMMARY OF THE INVENTION

My present invention distinguishes from the prior art and my above referred to patent by providing a method in which the steps of first curving a flat base member and applying the die pattern to the curved base member are eliminated. In the present invention I provide a unique initial step in which the steel rule die pattern is applied with the base member in flat condition, forming recesses in the base member according to the applied die pattern, and then curving the base member to the desired curvature and inserting the steel rules into the recesses. In a curved steel rule die, the outer working edges of the steel rules extending axially of the axis of rotation of the cylinder on which the steel rule die is

mounted are disposed at a predetermined radius with respect to the axis of rotation of the cylinder. According to my present invention with the pattern applied to the base member in flat condition, the pattern for the axially extending steel rules must be compensated for so that in forming the flat recessed base member into the curvature of the cylinder for carrying the die, the working edges of the axially extending steel rules lie at a predetermined radius with respect to the axis of rotation of the cylinder. As will presently appear from the following detailed description of the invention, the application of the pattern to the flat base member may be achieved in several ways.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a flat base member for a steel rule die to which the pattern for steel rules has been applied;

FIG. 2 is a plan view of the base member of FIG. 1 and in which recesses have been formed in the base member according to the pattern applied as shown in FIG. 1;

FIG. 3 shows the base member of FIG. 2 bent to a curvature to correspond to the radius of a cylinder of a press for carrying the steel rule die;

FIG. 4 is a view of the base member of FIG. 3 with steel rules inserted into the recesses to complete the steel rule die of the invention; and

FIG. 5 is a vertical sectional view taken substantially along the line 5—5 of FIG. 4 looking in the direction indicated by the arrows.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to FIG. 1 there is shown a base member 5 fabricated of any suitable relatively firm material, such as plywood or plastic, characterized by being formable into arcuate configuration, and in which recesses or slots may be formed for receiving steel rules as will be described.

As shown in FIG. 1, a pattern is applied to the upper surface of the base member at which recesses or slots are to be formed for receiving and supporting steel rules. In the example shown, the applied pattern comprises a plurality of pattern lines at 6 through 11, and a plurality of pattern lines 12 through 15 extending in crossing relation to the plurality of pattern lines 6 through 11. After application of a pattern, the base member 5 as shown in FIG. 2 is recessed at lines 6 through 11, as at 6*a* through 11*a*, and at the several pattern lines 12 through 15, as at 12*a* through 15*a* to receive steel rules.

The base member 5 is then arcurately curved between its end edges 16 and 17, as shown in FIG. 3, to conform to the surface of a cylinder of a press for carrying the base member so that the recesses 6*a* through 11*a* extend axially of the axis of the cylinder on which the base member is mounted, and with the slots or recesses 12*a* through 15*a* extending transversely of the axis of the cylinder.

With the base member 5 in its arcuate position a plurality of straight steel rules 6*b* through 11*b* are inserted into the recesses or slots 6*a* through 11*a*, respectively, and a plurality of curved steel rules 12*b* through 15*b* are inserted into the slots 12*a* through 15*a*, respectively. The several steel rules are supported in the base member so that the outer working edges thereof lie at a common predetermined radius with respect to the axis of rotation of the cylinder.

In that the working edges of the steel rules are radially outwardly of the upper surface of the base member 5, it will be recognized that the pattern lines 6 through 11 must be applied to the base member when in its flat condition

in FIG. 1 to compensate for disposition of the outer working edges of the straight steel rules **6***b* through **11***b* to dispose such outer working edges at the desired predetermined radius from the axis of rotation of the cylinder. This problem, however, does not exist in the application of the pattern lines **12** through **15** or the slots **12***a* through **15***a* for receiving the curved steel rules **12***b* through **15***b*, in that these curved steel rules extend transversely to the axis of the cylinder, and since they may be appropriately formed of curved configuration, no compensation need be made for disposing the outer working edges of such steel rules at the desired predetermined radius from the axis of rotation of the cylinder.

Thus, an important facet of the invention is to apply the pattern lines **6** through **11** for the straight steel rules to the upper surface of the base member **5** to provide for the desired predetermined positioning of the outer working edges of steel rules **6***b* through **11***b* inserted in the recesses of slots **6***a* through **11***a* of the base member. This may be achieved in several ways. By way of example let it be assumed that the bearers at the ends of the cylinder of the press for receiving the base member **5** are of 12 inch radius, and it is desired that steel rules have their outer working edges lying .0125 inch radially outwardly of the outer cylindrical surfaces of the bearers of the cylinder of the press so that the outer working edges of the straight steel rules **6***b* through **11***b* are at a radius of 12.0125 inches from the axis of rotation of the cylinder. In this typical example the base member **5** has its upper surface lying .1875 inch below the outer working edges of the straight steel rules. Thus, by subtracting the distance of .1875 inch of the base member **5** below the working edges of the steel rules **6***b* through **11***b* from the radius of the outer edges of the steel rules **6***b* through **11***b* it will be found that the radius of the outer surface of the base member is 11.825 inches.

In the foregoing example, the circumference at the outer edges of the steel rules **6***b* through **11***b* equals 75.47694 inches as derived from doubling the radius of 12.0125 inches times π (3.1416). Similarly the circumference at the outer surface of the base member may be calculated by doubling its radius of 11.825 inch times π (3.1416) so that it measures 74.29884 inches. Thus the circumference of the outer surface of the base member of 74.29884 inches divided by the circumference of the outer working edges of the straight steel rules **6***b* through **11***b* gives a factor of correction of .98439 which, times 12 inches equals 11.81268. This is the theoretical correction per foot. Thus, in the parameters above given, the pattern lines **6** through **11** applied to the upper surface of the base member **5** on the basis of 11.81268 inches for a true 12 inches theoretically properly orients the pattern lines **6** through **11** on the upper surface of the base member. This however, is a theoretical correction per foot, but I have found that additional factors must also be considered. These factors are the stretch of the upper surface of the base member when curved from flat condition, as in FIG. 1 to FIG. 2, the shrinking of the lower surface of the base member **5** when curved, and the fact that the opposite walls of the slots or recesses **6***a* through **11***a* after formed in the flat base member which when curved will taper toward each other from the upper surface of the base member toward the lower surface of the base member. Taking these and other factors into account it was empirically determined that an additional correction of .01232 inch was needed. Thus, the aforementioned theoretical correction of 11.81268 inches plus the last noted additional correction of .01232 inch equals 11.825 inches. Thus a die maker in laying out the desired pattern on the upper surface of the base member **5** for the pattern lines **6** through **11** may utilize what may be termed a "stretch ruler" in which 11.825 inches equals 12 inches. for the pattern lines **12** through **15** an honest ruler may be used in which 12 inches equals 12 inches.

In FIG. 3 there is shown a so-called "stretch ruler" **20** and an honest ruler **21** with the stretch ruler **20** being actually of 11.825 inches for 12 inches, and the honest ruler 12 inches for 12 inches. In the completed curved steel die of FIG. 4, and as seen in FIG. 5, the outer working edges of all the steel rules lie at the same predetermined radius of the axis of a cylinder **25** of a press on which the dies mounted.

The use of a so-called stretch ruler and an honest ruler are convenient for use by a die maker in building a curved steel rule die according to the present invention.

However, the principle of application of the pattern to the upper surface of the base member may be easily achieved by other means. For example, photographically or by transferred impression techniques. In the transferred impession technique a line drawing may be prepared using the above described stretch ruler and honest ruler which drawing could then be photographically or by transferred impression be applied to the upper surface of base member **5**. The same result could be achieved by using a line drawing or other layout that has not been corrected but instead has been curved to the desired radius prior to photographing the same, and then applying the photograph to the base member. Another alternative would be to make the pattern layout without correction and make a photographic negative of it and then curving the negative to the predetermined radius and projecting the negative on a positively sensitized surface on the flat base member.

The invention claimed is:

1. The method of making a curved steel rule die from a flat base member curved to provide a curved base member of predetermined radius having an inner cylindrical surface corresponding to the radius of the outer cylindrical surface of a cylinder for carrying the die, and said curved base member having recesses extending axially thereof for receiving steel rules having their outer working edges lying at a predetermined radius with respect to the axis of said cylinder outwardly of the outer surface of said curved base member comprising the steps of forming recesses in said flat base member to provide said axially extending recesses of said curved base member, said recesses of said flat base member providing said axially extending recesses of said curved base member being predeterminedly spaced apart so that upon forming said flat base member into said curved base member, axially extending steel rules inserted into said axially extending recesses, will have their outer working edges lying at said predetermined radius outwardly of the outer surface of said curved base member, curving said flat base member to the curvature of said predetermined radius of said curved base member, and inserting straight steel rules into said recesses of said curved base member.

2. The method of claim **1** characterized by the further step of forming additional recesses in said flat base member extending transversely of said first recesses to provide the recesses extending transversely of the axis of said curved base member, and in the last step of inserting curved steel rules into said additional recesses extending transversely of the axis of said curved base member with the outer working edges of said curved steel rules lying at said predetermined radius outwardly of the outer surface of said curved base member.

References Cited

UNITED STATES PATENTS

2,863,337	12/1958	Ackley	76—107
3,355,969	12/1967	Sarka	76—107

BERNARD STICKNEY, Primary Examiner

U.S. Cl. X.R.

93—58.2