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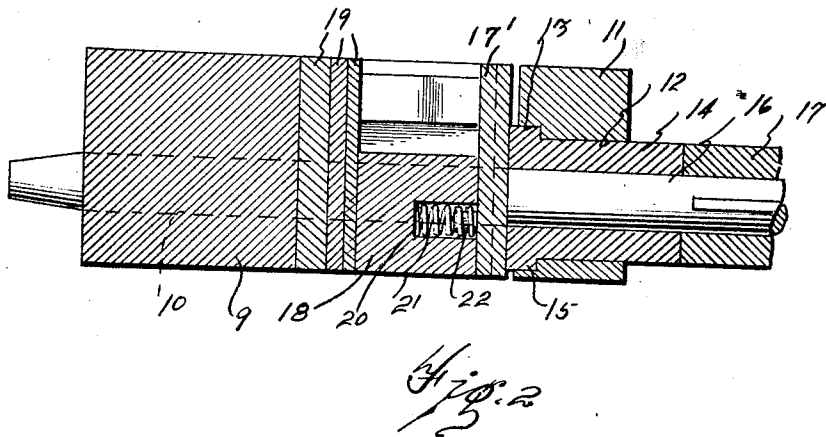
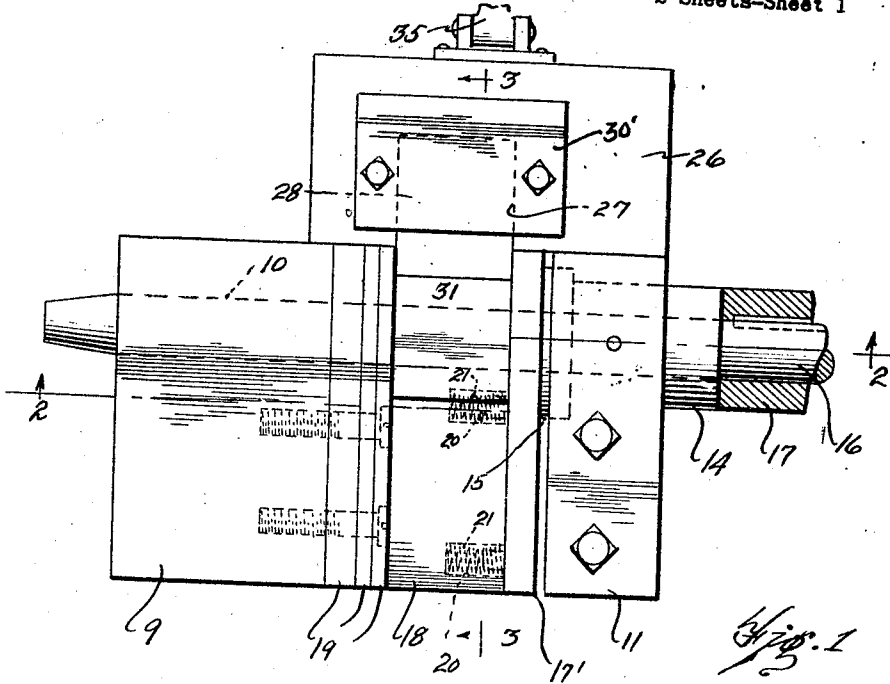
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SPRING FORMING DIE

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2 Sheets-Sheet 1



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## UNITED STATES PATENT OFFICE.

WILLIAM A. COOK, OF MOUNT CLEMENS, MICHIGAN.

## SPRING-FORMING DIE.

Application filed November 20, 1923. Serial No. 675,866.

*To all whom it may concern:*

Be it known that I, WILLIAM A. COOK, a citizen of the United States, residing at Mount Clemens, in the county of Macomb and State of Michigan, have invented a new and useful Improvement in a Spring-Forming Die, of which the following is a specification.

My invention relates to a new and useful improvement in spring forming dies and particularly that class of dies which is used for forming the eyelet on the ends of leaf springs adapted for use with vehicles.

An object of the invention is the provision of spring dies of this class which may be interchangeable for use with work-pieces of various widths and sizes.

Another object of the invention is the provision of spring dies of this class cooperating with an adjustable side bearing block, the side bearing block having removable parts which may bring about an adjustment to accommodate work-pieces of various widths.

Another object of the invention is the provision of means for aligning the length of the work-piece with the eyelet to be formed.

Another object of the invention is the provision of means for snugly engaging the side of the work-piece for aligning the same at the time the eyelet is formed.

Another object of the invention is the provision of means for disengaging the aligning member from the work-piece upon the withdrawal of the core from the eyelet formed.

Another object of the invention is the provision of means for bringing the aligning member into engagement with the side of the work-piece upon the movement of the eyelet core into operative position.

Other objects will appear hereinafter.

The invention consists in the combination and arrangement of parts hereinafter described and claimed.

The invention will be best understood from a reference to the accompanying drawings which form a part of this specification and in which,

Figure 1 is a top plan view of the invention,

Fig. 2 is a sectional view taken on substantially line 2—2 of Fig. 1,

Fig. 3 is a sectional view taken on substantially line 3—3 of Fig. 1, showing the forming members spaced apart, and,

Fig. 4 is a view similar to Fig. 3 showing the forming members closed together.

In machines used for forming the eyelet on leaf springs a forming member is slidably positioned so as to move into engagement with the end of the work-piece, forcing said end around a core which moves into operative position at the same time the forming member approaches the work-piece. The forming member comprises a die which cooperates with the stationary die on which the work-piece is positioned, the core being projected transversely of the work-piece at the under surface thereof. The core is cylindrical, so that when the work-piece is forced around it a circular eyelet is formed. The movable die is mounted in a slidable thrust plate, and the stationary die is mounted between two side bearing blocks which serve to prevent a very great amount of lateral movement of the work-piece, but which do not hold the work-piece snugly in position. With machines as now used, when it is desired to form an eyelet on larger work-pieces it is necessary to remove from the plate of the machine the thrust block, the movable die, the stationary die, and the two side bearing plates. In the present invention means are set forth whereby the same machine may be used for forming eyelets of different widths or sizes and on material of different widths and sizes by simply removing and replacing the dies, the side plates and the thrust block remaining the same.

In machines as now used there is provided no means for aligning the work-piece with the eyelet formed so that the eyelet is often twisted relatively to the work-piece and does not extend directly transversely of the work-piece. Subsequent aligning of the eyelet is necessary before the leaf may be used, which results in additional manufacturing cost and often in scrapping of much material. The present invention sets forth means for the proper alignment of the eyelet with the work-piece at the time, or just previous to the time, the eyelet is formed, so that the eyelet always extends transversely of the work-piece.

The present invention is adapted for use with the usual machine used for this work, and employs the same means for moving the movable die into forming position and for moving the core into operative and inoperative position, and for this reason these parts

of the machine are not shown in the drawings, the same forming no part of the present invention.

The invention in its preferred form comprises a side-bearing block 9 which is bolted or otherwise fastened securely to the bed 30 of the machine with which used. The side bearing member 9 is provided with a bore 10 formed therein. Securely fastened to the bed 30 and spaced apart from the block 9 is a side bearing block 11 which is provided with a bore 12 having a recess 13 formed adjacent one end thereof. A bushing 14 is adapted for positioning in said bore, said bushing having a flange 15 at one end thereof adapted for seating in the recess 13. Projected through the bushing and through the bore 10 is a cylindrical core forming member 16. This member 16 is adapted for slidable movement and is designed to move into the position shown in Fig. 1 when in operative position, so that the work-piece may be forced around the same, as shown in Fig. 4. The movement of the member 16 precedes the movement of the die which is movable. After the forming operation the member 16 is adapted to be retracted from the bore 10 and withdrawn sufficiently to allow the removal of the formed work-piece. This movement of the member 16 is effected by means of an arm which is attached thereto by means of a sleeve 17 which is keyed thereon or secured thereto by a set screw.

An aligning plate 17' is provided with an opening through which the member 16 projects when in operative position. This aligning plate is positioned loosely on the member 16 and is free to move relatively to the side bearing block 11. Projecting from one face of this plate 17' are trunnions 22 which are embraced by coil springs 21 positioned in sockets formed in a die 18 which is fixedly attached to the bed of the machine with which used. The springs project beyond the sockets 20 so as to normally hold the plate 17' in spaced relation to the die 18, and in engagement with the face of the side bearing block 11.

The side bearing block 9 is provided with a plurality of adjustment plates 19 which are attached thereto with suitable bolts or other fastening means. If it is desired to form a spring from metal of various widths the space between the side bearing blocks 9 and 11 may be altered by attaching other plates 19 to the block 9 or removing some therefrom, these plates being made of various thicknesses to provide the proper spacing between the side bearing blocks.

As shown in Fig. 3 the stationary die 18 is provided with an inclined upper surface 23, the end of said die being formed circular and terminating with a tongue 25 which extends from the circular portion 24.

Slidably mounted on the bed of the machine is a thrust block 26 which is provided with a slot 27 in which the shank of a die 28 may be positioned. This die 28 is provided with a cut away portion which provides a shoulder 29 against which may be positioned a suitable plate 30' which is fastened to the thrust block to prevent any raising of the die when in use. The die 28 is provided with a nose portion 31, having the under surface thereof downwardly inclined as at 32, which terminates in a circular portion 33, and a tongue 34. An arm 35 is suitably connected to the thrust block for moving the die into operative position.

In operation the work-piece 36 is placed on the surface 23 having the end 37 thereof projecting beyond the center of the bore 10 the proper distance, which will depend upon the size of the eyelet to be formed. When the machine is tripped so that the moving parts are set into operation the member 16 is moved into the position shown in Fig. 1. When this is done the sleeve 17 is brought into engagement with the end of the bushing 14. The bushing 14 is by the sleeve 17 forced inwardly toward the work-piece and the head or flange of the bushing forces the alignment plate into engagement with the side of the work-piece, against the pressure of the coil springs. This alignment plate forces the material against the side bearing block 9, or its attached plates, and thus maintains the work-piece in vertical relation to the axis of the core forming member 16, during the forming of the eyelet on the end of the work-piece. The arm 35 moves the die 28 into engagement with the work-piece, forcing the end of the same around the core 16, until the movable die and the stationary die are in the relation shown in Fig. 4. The arm operating the movable die then retracts the die and the arm moving the member 16 withdraws the same from engagement with the eyelet formed. The springs 21 at the same time force the plate 17' out of engagement with the work-piece, restoring the head of the bushing to its normal position, so that the flange 15 rests in the recess of the side bearing block, flush with the face thereof. In this way the material is firmly held at each side during the forming operation and a proper alignment with the body of the material is assured for the eyelet. In the forming operation illustrated I have shown the invention used for a finishing operation, the end 37 having been partially formed in another forming machine preliminary to entering the finishing former.

If it is desired to operate on material of different widths the space between the side bearing blocks may be adjusted as already described. The stationary die may then be replaced with a die of the proper dimensions

and the movable die may also be replaced with a die of the proper dimensions. In this case it is to be noted that the thrust block remains the same in all operations, the shanks of the various dies being uniform so that they will engage in the slot 27. This feature results in fewer displacements of parts for adjusting the machine to various sizes and also makes it possible to use the various parts for different sized machines, the common sizes now being in use being the four and six inch machines, for either of which the invention is equally well adapted.

It is to be noted that the plane of the surface 23 is tangent to the periphery of the core forming member 16, so that the surface of the work-piece 36 is tangent to the core forming member 16. It is also to be noted that the surface 32 lies in the same plane for the greater portion of its length, and that the plane in which this surface lies is parallel to the plane of the surface 23. Thus the surface 23 engages the work-piece as does the surface 32 when the dies are in the position shown in Fig. 4. This structure prevents any buckling of the work-piece adjacent the eyelet, and maintains the main body of the work-piece in a straight condition at this point. In the machines now in use the work-piece frequently is distorted out of normal shape adjacent the eyelet so that the buckle or kink has to be afterwards straightened out. This results in additional cost of manufacture and frequently in the scrapping of the work-piece after the operation is completed.

While I have illustrated and described the preferred form of structure I do not wish to limit myself to the precise form of structure shown but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention what I claim as new and desire to secure by Letter's Patent is:

1. A spring forming die comprising a movable die; a stationary die; an aligning member adapted for aligning the work-piece; a core forming member; and means mounted on said core forming member for moving said aligning member into engagement with the work piece.

2. A spring forming die comprising a

movable die; a stationary die; an aligning member for aligning the work-piece; a core forming member; means mounted on said core forming member for moving said aligning member into engagement with the work-piece; and means for moving said aligning member out of engagement with the work-piece upon the completion of the forming operation.

3. A spring forming die, adapted for use with a forming mechanism, having a die moving member, a movable core and a core moving member, comprising a pair of co-operating eyelet forming dies; and aligning means for aligning the work-piece relatively to said dies upon movement of said core beyond a predetermined distance, said aligning means effecting a predetermined relative location of the longitudinal axis of the work-piece and the axis of said core.

4. A spring forming die including an eyelet forming core adapted for forming an eyelet at one end of a work-piece and comprising a set of forming dies co-operating with said eyelet forming core; means engageable with the opposite edges of said work-piece for aligning the same with the eyelet to be formed; and means for releasing said aligning means upon the withdrawal of said core.

5. In combination with an eyelet forming device, adapted for forming eyelets on a work-piece, a set of forming dies; and means separate from and movable relatively to said forming dies adapted for engaging, in clamping relation, the opposite edges of said work-piece at the portion formed into an eyelet for aligning and maintaining the alignment of the main body of said work-piece with the eyelet to be formed.

6. A spring forming die, adapted for use with a forming mechanism having a die moving member, a movable core and a core-moving member, comprising a set of forming dies; and means movable relatively to said forming dies for engaging the opposite edges of the work-piece operated upon by said dies for aligning the work-piece with said dies, said means being projected transversely of and positioned on opposite sides of the axis of said core.

In testimony whereof I have signed the foregoing specification.

WILLIAM A. COOK.