June 11, 1940. A. A. HALE 2,204,273

TUBE SLOTTING OR PUNCHING DIE

Filed Feb. 3, 1940 2 Sheets-Sheet 1

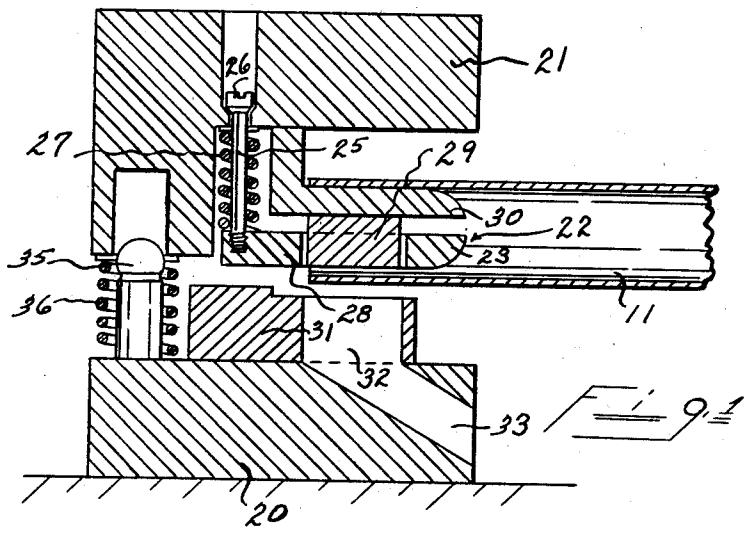


Fig. 1

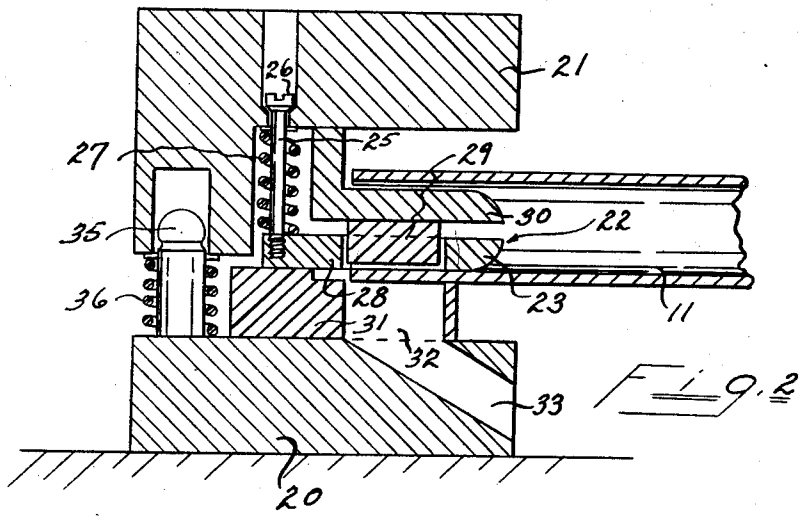


Fig. 2

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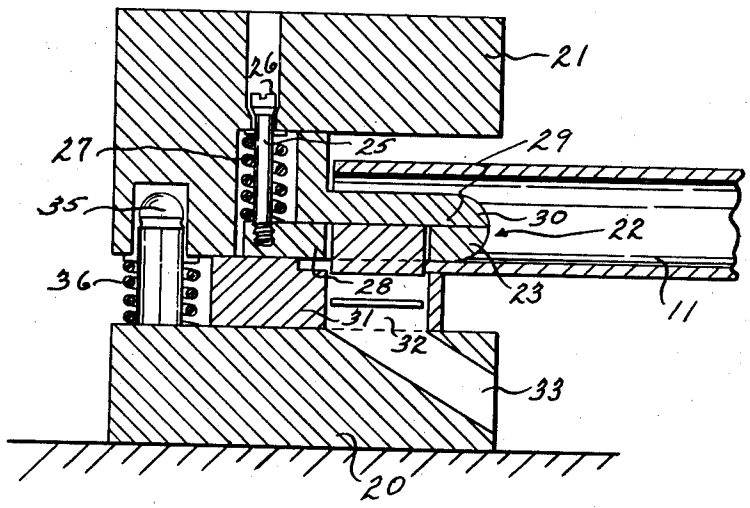


Fig. 3

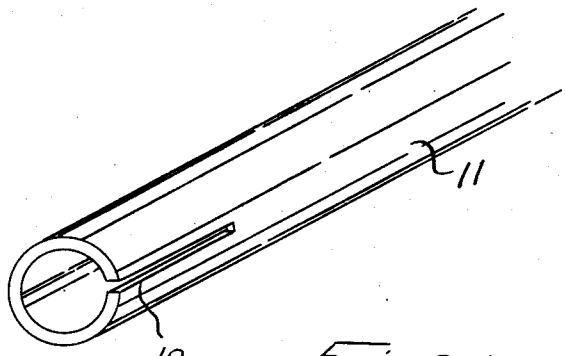


Fig. 4

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TUBE SLOTTING OR PUNCHING DIE

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Application February 3, 1940, Serial No. 317,079

7 Claims. (Cl. 164—108)

This application relates to dies for slotting or punching holes in tubes from the inside outwardly wherein the slotting or punching blade moves rectilinearly, and radially of the tube.

For an understanding of the die herein described, reference should be had to the appended drawings. In these drawings,

Fig. 1 shows a slotting or punching die with a tube end therein, at the start of the operation;

Fig. 2 shows the parts at a further stage in the operation with the tube end clamped in place and ready to be slotted;

Fig. 3 shows the completion of the operation, just prior to the return of the parts of the machine to the starting position of Fig. 1;

Fig. 4 shows a tube having its end slotted.

Referring to the drawings, it will be seen that the die herein disclosed is designed to provide a slot as indicated at 10 in an open end tube shown at 11, Fig. 4.

The die includes a stationary block 20 and a movable block 21, these normally being spaced in the direction of relative movement of the two blocks to provide a space into which an end of the tube to be slotted or punched may be inserted. Within the space between the blocks is an arbor, referenced as a whole 22, adapted to be received within the open end of the tube. The arbor comprises a pressure pad 23 into which is threaded the end of a cap screw 25 whose head 26 is within a bore of the block 21 whereby that block carries the pressure pad. A coiled compression spring 27 between the block 21 and the pad 23 controls movement of the block 21 and the pad 23.

Within a slot 28 of the pad 23 is a blade or punch 29 fixed to a second arbor part 30 in turn fixed to the block 21.

The lower block 20 which is stationary, includes an anvil 31 having a slot or hole 32 corresponding to the shape of the blade or punch 29 and a chute or way 33 leads from the lower end of the hole 32 for discharge of punched out slugs or blanks.

The block 21 is guided in its movement by a plurality of guide pins 35 surrounded by coiled compression springs 36.

A ram is provided (not shown) to move block 21 towards block 20 against the influence of the return springs 36.

The operation of the die herein disclosed is as follows:

Normally the parts are in the position of Fig. 1. A tube end may be inserted in the space between blocks 20—21 to surround the arbor 22. Downward pressure on block 21 provided by a ram of a press or the like, not shown, will force the block 21 and all parts carried by it, including parts referenced 23 through 30 downwardly, meanwhile, compressing springs 36, until the arbor presses down against the lower side of the tube 11 and presses that tube against the anvil 31.

Continued downward movement of the block 21, responsive to continued movement of the ram will compress spring 27 without however moving pressure pad 23, then against the tube, and will force the blade or punch 29 through the tube 11 to punch or slot the tube, the slug or blank dropping into hole 32 and out of chute 33.

Release of downward pressure from the block 21 will permit springs 36 to raise the arbor 22 as a whole and return the parts to the normal position, whereafter the tube 11 may be withdrawn from the die.

It will be seen that the motion of the arbor is rectilinear, and radial of the tube, and this distinguishes the die herein disclosed from dies heretofore known where cams or wedges were utilized, these moving longitudinally of the tube or rotating within the tube around the axis of the tube. The die herein disclosed is far simpler in construction and far superior than dies heretofore known and above described.

Now having described the die herein disclosed, reference should be had to the claims which follow for a determination of the invention:

I claim:

1. A die for punching holes in side walls of open-ended tubes, near their ends, from the insides of the tubes outwardly, comprising a stationary block and a movable block, these being spaced in the direction of relative movement of the two blocks to provide a space into which an end of the tube may be inserted, means for moving the movable block away from the stationary block, said means being overcome upon the application of force to move the movable block towards the stationary block, an arbor in the space between the blocks having a free end adapted to be received within the open end of the tube and mounted at its other end on the movable block, the arbor consisting of two parts normally relatively separated radially of the tube and arranged to be movable rectilinearly relatively towards and away from each other and having a blade fixed to one of said parts projecting through a slot in the other, the stationary block having a blank chute aligned with said blade of a size to receive and clear a punched

blank, a coiled compression spring between the movable block and the slotted arbor part for separating such block and part, the arbor being so constructed that, when the arbor parts are separated relatively, movement of the movable block towards the stationary block first causes the arbor as a whole to approach the stationary block to clamp a tube against it, and then loads the spring to hold the arbor in tube-clamping position, and then causes the blade to approach and punch the tube, after which, with the release of pressure on the movable block, the latter leaves the stationary block and the blade leaves the tube.

2. A die for punching holes in side walls of open-ended tubes, near their ends, from the insides of the tubes outwardly, comprising a stationary block and a movable block, these being spaced in the direction of relative movement of the two blocks to provide a space into which an end of the tube may be inserted, a coiled compression spring for moving the movable block away from the stationary block, said spring being overcome upon the application of force to move the movable block towards the stationary block, an arbor in the space between the blocks having a free end adapted to be received within the open end of the tube and mounted at its other end on the movable block, the arbor consisting of two parts normally relatively separated radially of the tube and arranged to be movable rectilinearly relatively towards and away from each other and having a blade fixed to one of said parts projecting through a slot in the other, the stationary block having a blank chute aligned with said blade of a size to receive and clear a punched blank, a coiled compression spring between the movable block and the slotted arbor part for separating such block and part, the arbor being so constructed that, when the arbor parts are separated relatively, movement of the movable block towards the stationary block first causes the arbor as a whole to approach the stationary block to clamp a tube against it, and then loads the spring to hold the arbor in tube-clamping position, and then causes the blade to approach and punch the tube, after which, with the release of pressure on the movable block, the latter leaves the stationary block and the blade leaves the tube.

3. A die for punching holes in side walls of open-ended tubes, near their ends, from the insides of the tubes outwardly, comprising a stationary block and a movable block, these being spaced in the direction of relative movement of the two blocks to provide a space into which an end of the tube may be inserted, means for moving the movable block away from the stationary block, said means being overcome upon the application of force to move the movable block towards the stationary block, formations on the two blocks for guiding the movable block in its movement towards and away from the stationary block, an arbor in the space between the blocks having a free end adapted to be received within the open end of the tube and mounted at its other end on the movable block, the arbor consisting of two parts normally relatively separated radially of the tube and arranged to be movable rectilinearly relatively towards and away from each other and having a blade fixed to one of said parts projecting through a slot in the other, the stationary block having a blank chute aligned with said blade of a size to receive and clear a punched blank, a coiled compression spring between the movable block and the slotted arbor part for separating such block and part, the arbor being so constructed, when the arbor parts are separated relatively, movement of the movable block towards the stationary block first causes the arbor as a whole to approach the stationary block to clamp a tube against it, and then loads the spring to hold the arbor in tube-clamping position, and then causes the blade to approach and punch the tube, after which, with the release of pressure on the movable block, the latter leaves the stationary block and the blade leaves the tube.

4. A die for punching holes in side walls of open-ended tubes, near their ends, from the insides of the tubes outwardly, comprising a stationary block and a movable block, these being spaced in the direction of relative movement of the two blocks to provide a space into which an end of the tube may be inserted, a coiled compression spring for moving the movable block towards the stationary block, said spring being overcome upon the application of force to move the movable block towards the stationary block, formations on the two blocks for guiding the movable block in its movement towards and away from the stationary block, an arbor in the space between the blocks having a free end adapted to be received within the open end of the tube and mounted at its other end on the movable block, the arbor consisting of two parts normally relatively separated radially of the tube and arranged to be movable rectilinearly relatively towards and away from each other and having a blade fixed to one of said parts projecting through a slot in the other, the stationary block having a blank chute aligned with said blade of a size to receive and clear a punched blank, a coiled compression spring between the movable block and the slotted arbor part for separating such block and part, the arbor being so constructed that, when the arbor parts are separated relatively, movement of the movable block towards the stationary block first causes the arbor as a whole to approach the stationary block to clamp a tube against it, and then loads the spring to hold the arbor in tube-clamping position, and then causes the blade to approach and punch the tube, after which, with the release of pressure on the movable block, the latter leaves the stationary block and the blade leaves the tube.

5. A die for punching holes in side walls of open-ended tubes, near their ends, from the insides of the tubes outwardly, comprising a stationary block and a movable block, these being spaced in the direction of relative movement of the two blocks to provide a space into which an end of the tube may be inserted, means for moving the movable block away from the stationary block, said means being overcome upon the application of force to move the movable force towards the stationary block, formations on the two blocks for guiding the movable block towards and away from the stationary block, comprising a guide pin on one block fitting in a guide bore of the other block, an arbor in the space between the blocks having a free end adapted to be received within the open end of the tube and mounted at its other end on the movable block, the arbor consisting of two parts normally relatively separated radially of the tube and arranged to be movable rectilinearly relatively towards and away from each other and having a blade fixed to one of said parts projecting through a slot in the other, the stationary block having a

blank chute aligned with said blade of a size to receive and clear a punched blank, a coiled compression spring between the movable block and the slotted arbor part for separating such block and part, the arbor being so constructed that, when the arbor parts are separated relatively, movement of the movable block towards the stationary block first causes the arbor as a whole to approach the stationary block to clamp a tube against it, and then loads the spring to hold the arbor in the tube clamping position, and then causes the blade to approach and punch the tube, after which, with the release of pressure on the movable block, the latter leaves the stationary block and the blade leaves the tube.

6. A die for punching holes in side walls of open-ended tubes, near their ends, from the insides of the tubes outwardly, comprising a stationary block and a movable block, these being spaced in the direction of relative movement of the two blocks to provide a space into which an end of the tube may be inserted, a coiled compression spring for moving the movable block away from the stationary block, said spring being overcome upon the application of force to move the movable block towards the stationary block, formations on the two blocks for guiding the movable block towards and away from the stationary block, comprising a guide pin on one block fitting in a guide bore of the other block, an arbor in the space between the blocks having a free end adapted to be received within the open end of the tube and mounted at its other end on the movable block, the arbor consisting of two parts normally relatively separated towards and away from each other and having a blade fixed to one of said parts projecting through a slot in the other, the stationary block having a blank chute aligned with said blade of a size to receive and clear a punched blank, a coiled compression spring between the movable block and the slotted arbor part for separating such block and part, the arbor being so constructed that, when the arbor parts are separated relatively, movement of the movable block towards the stationary block first causes the arbor as a whole to approach the stationary block to clamp a tube against it, and then loads the spring to hold the arbor in tube clamping position, and then causes the blade to approach and punch the tube, after which, with the release of pressure on the movable block, the latter leaves the stationary block and the blade leaves the tube.

7. A die for punching holes in side walls of open-ended tubes, near their ends, from the insides of the tubes outwardly, comprising a stationary block and a movable block, these being spaced in the direction of relative movement of the two blocks to provide a space into which an end of the tube may be inserted, a coiled compression spring for moving the movable block away from the stationary block, said spring being overcome upon the application of force to move the movable block towards the stationary block, formations on the two blocks for guiding the movable block in its movement towards and away from the stationary block, comprising a guide pin on one block fitting in a guide bore of the other block, the coiled compression spring for moving the movable block away from the stationary block surrounding the guide pin, an arbor in the space between the blocks having a free end adapted to be received within the open end of the tube and mounted at its other end on the movable block, the arbor consisting of two parts normally relatively separated radially of the tube and arranged to be movable rectilinearly relatively towards and away from each other and having a blade fixed to one of said parts projecting through a slot in the other, the stationary block having a blank chute aligned with said blade of a size to receive and clear a punched blank, a coiled compression spring between the movable block and the slotted arbor part for separating such block and part, the arbor being so constructed, when the arbor parts are separated relatively, movement of the movable block towards the stationary block first causes the arbor as a whole to approach the stationary block to clamp a tube against it, and then loads the spring to hold the arbor in tube clamping position, and then causes the blade to approach and punch the tube, after which, with the release of pressure on the movable block, the latter leaves the stationary block and the blade leaves the tube.

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