United States Patent

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[33] **U.S.S.R.**
[31] **1304654**

[54] **METHOD OF MANUFACTURING TWO CONCENTRIC PARTS THROUGH DIE BLANKING OF STEEL STRIPE**
1 Claim, 7 Drawing Figs.

[52] **U.S. Cl.** **83/50,** 83/55, 83/104, 83/405, 83/926
[51] **Int. Cl.** **B26d 7/18**
[50] **Field of Search** 83/50, 55, 104, 405, 926

[56] **References Cited**
UNITED STATES PATENTS

2,542,864	2/1951	Friedman	83/405 X
3,179,262	4/1965	Carlson, Sr. et al.	83/405 X

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ABSTRACT: The present disclosure relates to methods of manufacturing two concentric parts through die blanking, according to which a circular part and a central portion which is another part workpiece are simultaneously blanked from a strip in the upper die. During the opening of the upper die, the other part workpiece is separated, transferred downwards and held above the lower die until the latter opens, the strip leftover is removed from the upper die matrix and the strip moved by a blanking pitch, a ready part being picked up from the die punch during the last period of said die opening. When the punches' movement changes to reverse, the other part workpiece is let into the opening lower die and then placed on the die matrix, a ready part blanked during the previous cycle being removed from the punch of said die.

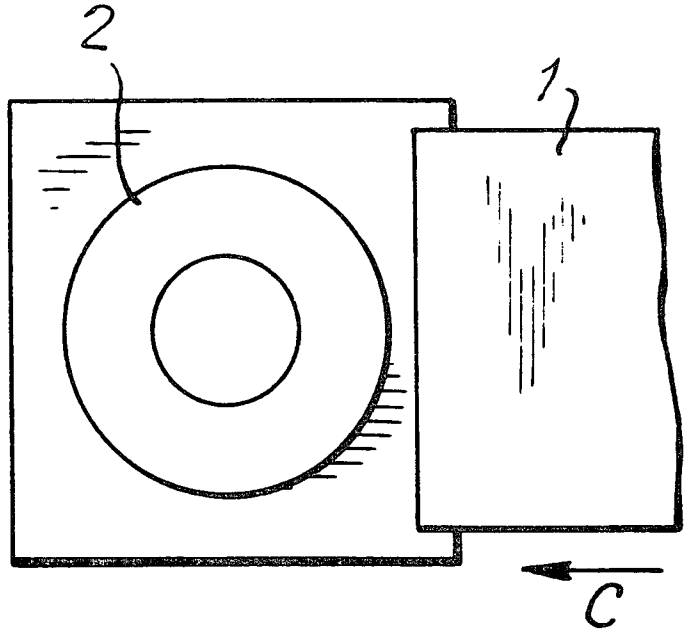


FIG. 1

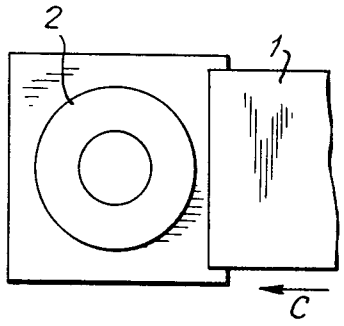


FIG. 5

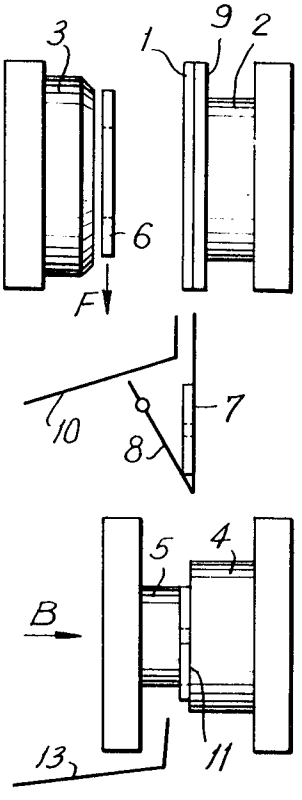


FIG. 4

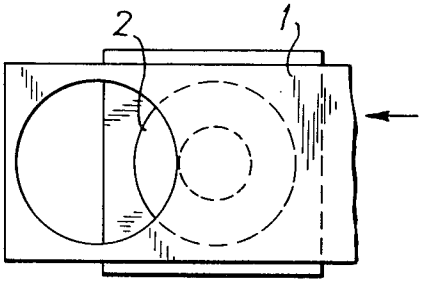


FIG. 2

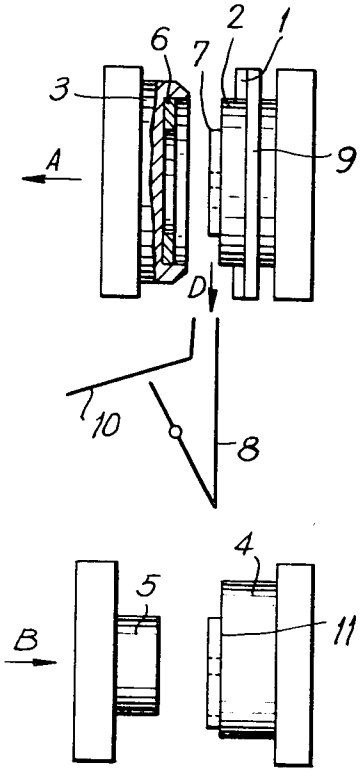


FIG. 3

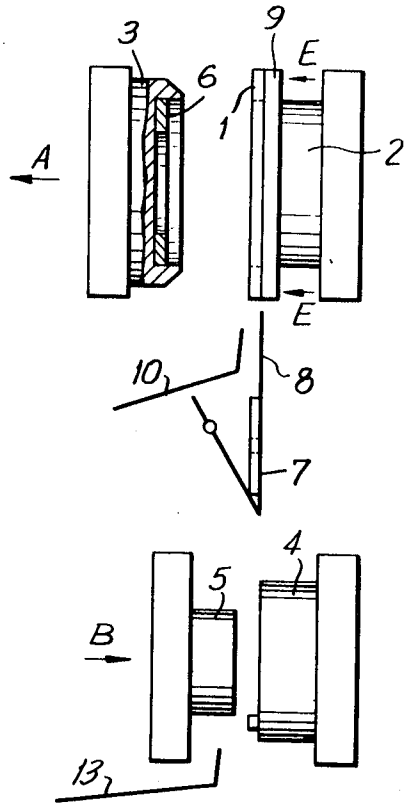


FIG. 6

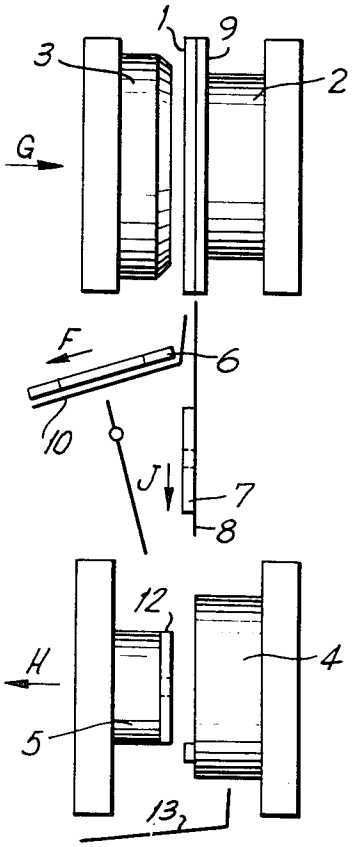
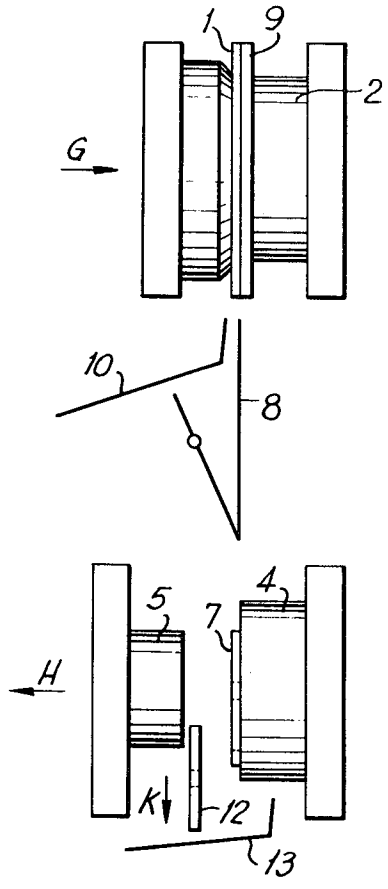


FIG. 7



METHOD OF MANUFACTURING TWO CONCENTRIC PARTS THROUGH DIE BLANKING OF STEEL STRIPE

The present invention relates to methods of manufacturing two concentric parts through die blanking of steel strips and can be used to manufacture the stator and rotor sheets of magnet wires for electric machines.

Known in the art is a method of manufacturing two concentric parts through die punching on two separate compound dies with a horizontally arranged blanking planes provided on separate multipurpose dies. According to that method, a circular part, stator sheet, as well as a central part serving as a rotor sheet workpiece are simultaneously blanked from a strip in the first (stator) die, the both parts being then removed from the blanking zone either manually or with the aid of some special arrangement and sorted out; rotor sheet workpieces are subsequently conveyed to another press fitted with a rotor die.

However, the removal of a ready stator sheet and a rotor sheet workpiece from the punches of the first die may result in their mutual coupling at the moment of feeding onto the matrix surface. This precludes the possibility of automizing the blanking process, as time delay with a simultaneous discontinuance of the press operation is required for separating the newly manufactured stator sheet from the rotor sheet workpiece and for clearing the blanking zone.

Also known is another method of manufacturing two concentric parts through die blanking of steel strips, consisting in that a circular part and a central portion are blanked from a strip at a time in one die, the central portion being a workpiece for the second part, which is fed to the other die. This method is realized on presses with compound dies arranged one above the other and with the vertically arranged blanking surfaces. The punches of these surfaces move reciprocally in opposite directions (cf., USSR Author's Certificate, No. 138,210, class 7, 32).

However, when manufacturing by this method two concentric parts on the presses with dies whose blanking surfaces are arranged vertically, no desired production efficiency can be attained for the newly manufactured part and the other part workpiece, both blanked in the upper die, can move together into the lower die because there is no distinct separation of these parts into two independent flows: that of ready parts moving beyond the press limits and that of second part workpieces into the lower die.

It is an object of the present invention to provide a method of manufacturing two concentric parts through die blanking from steel strips on presses with compound dies arranged one above the other and having vertically arranged blanking surfaces, according to which method a ready part and another part workpiece, both blanked in the upper die, would come in two distinctly independent flows: one automatically bringing a ready part out of the press limits and the other automatically directing the other part workpiece into the lower die.

Another object of the invention is to provide a method of manufacturing two concentric parts, according to which the displacement of newly manufactured parts and other part workpieces would take place as a result of their free fall.

According to the above-stated and other objects, in the method of manufacturing two concentric parts through die blanking of steel strips in presses with compound dies placed one above the other and having vertically arranged blanking surfaces whose punches move reciprocally in opposite directions, said method consisting in that a circular part and its central portion, which is another part workpiece fed into the lower die, are blanked from the upper die at a time, according to the invention, the other second part workpiece is separated at the moment of the upper die opening, moved downwards and held above the lower die until its opening. The strip leftover is removed from the upper die matrix, displaced by a blanking pitch and the circular part is taken from the punch of said die during the last period of its opening. After

that, once the direction of the punches movement is changed, the other part workpiece is let into the opening lower die and placed on said die matrix, with a fresh part blanked during a previous cycle being removed from the die punch.

Such an accomplishment of the object of the invention helps ensure a high production efficiency in manufacturing concentric parts from a steel strip material for only such an order of succession of techniques has made it possible to have two independent flows of ready parts blanked in the upper die and of other part workpieces, respectively, make use of the free fall for the movement of parts and workpieces, and to automize such operations as the blanking and subsequent removal of ready parts outside the press.

The invention will be more apparent from the description of an exemplary embodiment of the method of manufacturing stator and rotor sheets through die blanking from steel strips, reference being had to the appended drawings, wherein:

FIG. 1 shows a gear diagram of feeding a steel strip to blanking zone, according to the invention;

FIG. 2 shows the position of the dies after blanking a stator sheet and a rotor sheet workpiece on the upper die, shown in cross section;

FIG. 3 shows the position of the upper and lower dies at the moment of holding the rotor sheet workpiece, shown in cross section, above the lower die and removing the strip leftover from the matrix of the upper die;

FIG. 4 shows the displacement of a strip, by a blanking pitch, towards the blanking zone in a direction shown with arrow C, at the moment of opening the upper die;

FIG. 5 shows the position of the dies at the moment of the removal of a stator sheet shown in cross section from the punch of the upper die and of the fall of said sheet onto a removing chute;

FIG. 6 shows the mutual position of the dies at the moment of the fall of a rotor sheet workpiece shown in cross section into the opening lower die;

FIG. 7 shows the position of the dies at the moment of mounting a rotor sheet workpiece, shown in cross section, onto the lower die matrix and of removing a ready sheet, shown in cross section, from its punch.

The method of manufacturing stator or rotor sheets through die blanking from a strip 1 (FIG. 1) is effected in presses having compound dies arranged one above the other, with the blanking surfaces arranged vertically. The upper die comprises a matrix 4 and a punch 5. The punches 3 and 5 move reciprocally in opposite directions, the direction of their movement shown in the Figures with arrows A and B, respectively.

A strip 1 is fed, by a blanking pitch, to the open upper die in the direction shown with arrow C (FIG. 1). Once the blanking in the upper die is over, with a circular part (FIG. 2), stator sheet, and its central portion, rotor sheet, being blanked simultaneously out of the strip 1, the die gets opened, and as soon as the punch 3 withdraws from the matrix 2 in the direction shown with arrow A, a workpiece 7 is removed in the direction shown with arrow D. The workpiece 7 falls under its own weight into a device 8 provided above the lower die and is held there until the lower die gets opened.

The part 6 (FIG. 3), stator sheet, blanked in the upper die is kept on the punch 3 of this die until the latter opens completely. This spell of time is sufficient for removing the leftover of the strip 1 from the matrix 2 by moving a stripper 9 in a direction shown with arrow E, and the strip 1 (FIG. 4) is moved into this die by a blanking pitch in a direction shown with arrow C. During the last stage of the opening of the upper die, from its punch 3 is removed the part 6 (FIG. 5), stator sheet, which falls under its own weight in a direction shown with arrow F onto a chute 10 and is then removed outside the press limits.

Simultaneously, the lower die goes toward its counterpart, and a rotor sheet 12 (FIG. 6) is blanked out of a rotor sheet workpiece 11 prepared in the previous cycle.

When the movement of the punches 2 and 5 changes to reverse, i.e., when the punch 3 progresses in the direction shown with arrow G, and the punch 5 of the lower die in the direction indicated by arrow H, the rotor sheet workpiece 7, held in the device 8 until the opening of the lower die, is released and, as soon as the device 8 gets opened, it is forced in a direction shown with arrow J into the opening lower die, being placed on the matrix 4.

In case of the complete opening of the lower die, a blanked rotor sheet 12 is removed from the punch 5, which falls under its own weight in a direction indicated by arrow K (FIG. 7) downwards onto a chute 13 through which it is removed outside the press.

As soon as the direction of the punches' movement changes to reverse, the cycle of the blanking of the rotor and stator sheets, described hereinabove, repeats.

What we claim is:

1. A method of manufacturing two concentric parts through die blanking from steel strips in presses having compound dies

positioned one above the other, with blanking surfaces arranged vertically, the punches of said dies making reciprocal motion in opposite directions, said method involving operations of simultaneously blanking a circular part and a central portion which is another part workpiece from a strip in the upper die; separating said other part workpiece from the die matrix during the opening of said upper die, feeding the workpiece downwards and holding it above the lower die until the latter opens; removing the strip leftover from the upper die matrix during the opening of the latter and moving the strip by a blanking pitch into said die; removing said circular part from the punch of said die; removing said circular part from the punch of said upper die during the last period of its opening; letting said other part workpiece into the opening lower die and placing it on the die matrix in the course of changing the punches' movement to reverse, as well as removing a ready part blanked during the previous cycle from the die punch during the opening of said latter die.