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PRESS FOR COMMUTATOR RINGS AND THE LIKE

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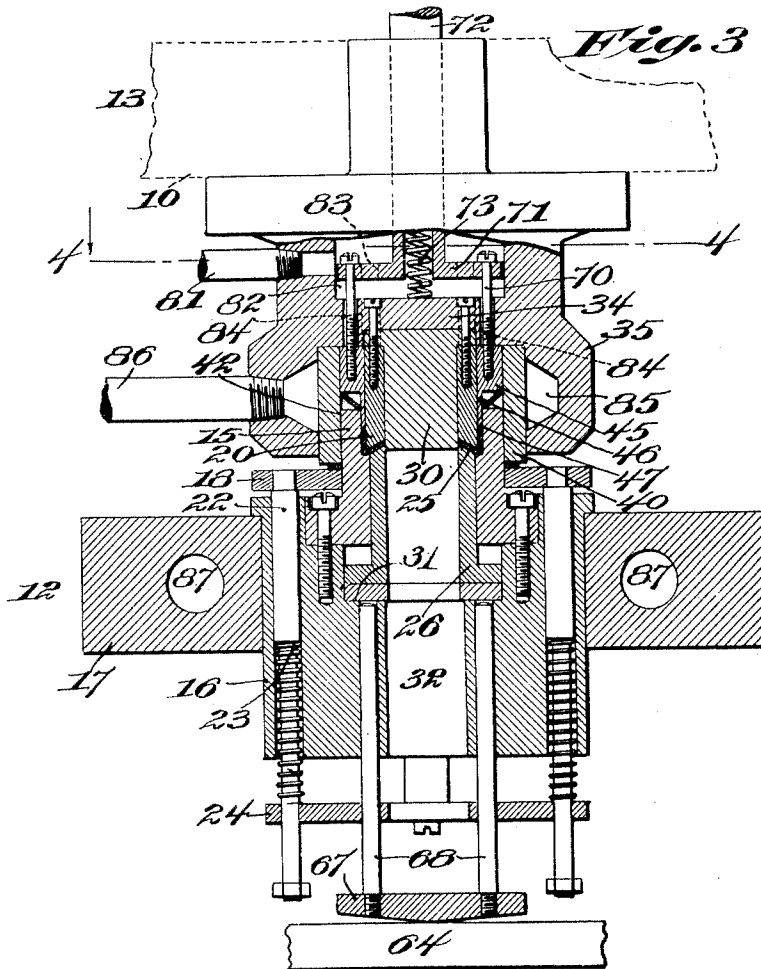


Fig. 4

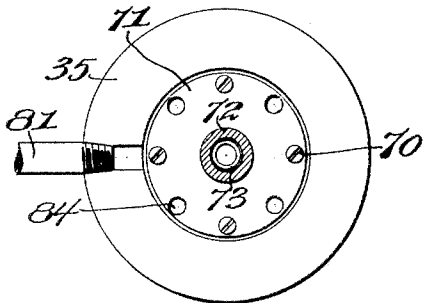
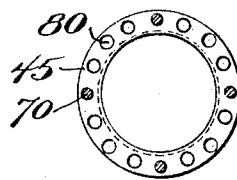


Fig. 5



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PRESS FOR COMMUTATOR RINGS AND THE LIKE

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This invention relates to apparatus for forming annular members from sheet material.

The object of the invention is to provide novel and improved apparatus of the character specified by which the annular members may be economically and rapidly produced. A further object of the invention is to provide novel and efficient apparatus for forming and molding commutator rings.

With these objects in view, the invention consists in the apparatus and the combinations and arrangements of parts hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention,

Fig. 1 is a sectional view of a sufficient portion of the apparatus to enable the invention to be understood;

Fig. 2 is a perspective of a commutator ring;

Fig. 3 is a view similar to Fig. 1, showing the parts of the apparatus in a different position of operation;

Fig. 4 is a sectional detail on the line 4—4 of Fig. 3; and

Fig. 5 is a detail in plan to be referred to.

The apparatus illustrated in the drawings is designed to form commutator rings of the construction illustrated in Fig. 2 from laminated mica in sheet form, although it is to be understood that viewed in the broader aspects of the invention, the different features thereof may be embodied in apparatus for forming other annular members.

Referring to the drawings, 10 and 12 represent respectively the movable and stationary members of a punch press indicated by the general reference 13, and which in general may be of any usual or preferred construction, preferably of the single cycle type in which the movable member 10 of the press comprises a reciprocatory ram intermittently actuated from a main crank shaft 14. The reciprocations of the ram 10 may and preferably will be initiated at each cycle in the usual manner by a foot control clutch (not shown).

The stationary member 12 of the press is

herein shown as provided with a recessed die or cup-shaped mold 15, secured to a block 16, affixed in and carried by a stationary portion 17 of the press frame. The sheet material 11, such as laminated mica in sheet form, from which the annular members are to be produced, is laid upon a supporting plate 18 to extend over the mouth of the cup-shaped mold 15 preparatory to the descent of a complementary molding element or projecting die 20 carried by the movable member 10 of the press. The supporting plate 18 is herein shown as mounted upon the upper ends of rods 22 which extend through holes in the block 16 and have springs interposed between a shoulder 23 thereon and an abutment plate 24 secured to the block 16, for yieldingly maintaining the plate 18 at the level of the upper surface of the cup-shaped mold 15, and for permitting depression of the plate 18 during the molding of the annular members when the movable member 10 of the press descends, as will be described.

For the production of insulating rings of the shape illustrated in Fig. 2 having an annular channel or groove and which are particularly designed for Ford motor commutators, the bottom of the cup-shaped mold 15 is arranged to taper or incline upwardly towards the center of the mold, and as herein shown, this tapered or inclined portion 25 of the mold is formed upon the upper surface of a receding die or plunger 26, slidably mounted within the cup-shaped mold 15 and capable of movement from the position shown in Fig. 3 to that shown in Fig. 1.

In forming commutator rings of the shape and construction illustrated in Fig. 2 from a blank or sheet of moldable material, provision is made for dieing out the central portion of the molded ring to form the opening 27 in the ring, and also for trimming the ring to size. For this purpose, as herein shown, the plunger 26 is hollow, providing a cutting edge 29 with which cooperates a cylindrical cutting member or die 30 carried by the movable member 10 of the press to be capable of descent with the movable member into the position illustrated in Fig. 3. The cooperation of the cylindrical cutting die 30 with the cut-

ting edge 29 upon the plunger 26 operates as will be apparent from an inspection of Fig. 3, to die out a circular disk from the center of the molded ring to thus form the opening 27 as shown in Fig. 2. The disk of material died out in this manner is permitted to fall downwardly through the hollow plunger 26 and through an aligned opening 32 in the block 16. As herein shown, the molding member or projecting die 20 comprises a hollow cylinder surrounding the cutting die 30 and having its annular molding surface 33 tapered or inclined complementary to the inclined or tapered surface 25 upon the upper end of the plunger 26. The molding member 20 is screwed or otherwise secured to the cross web 34 of a housing 35 secured to the movable member 10 of the press and comprising a part thereof. In order that the finished commutator ring may be of a predetermined size, provision is preferably made for first cutting from the blank of sheet material, a disk slightly larger than is required to form the finished ring, and thereafter accurately trimming such disk to size. For this purpose, as herein shown, an outer tubular cutting die 40 is affixed in the lower portion of the housing 35 as illustrated in Fig. 1, and is of such size as to cooperate with the outer edge 42 of the circumferential ledge of the cup-shaped mold so that when the movable member 10 of the press descends into the position illustrated in Fig. 3, the outer cutting die 40 cooperating with the cutting edge 42 upon the mold 15 serves to cut the sheet material into disk form of approximate size. Between the outer cutting die 40 and the projecting die 20, an auxiliary trimming member 45 is provided herein shown as comprising a cylindrical sleeve relatively movable on the outer surface of the projecting die. The lower portion of the auxiliary trimming member 45 is cut away to form a relatively narrow wall 46 having a blunt end, the outer lower edge 47 of which comprises a cutting edge which is adapted to cooperate with the inner edge 50 of the circumferential ledge of the mold 15 so that when the parts of the apparatus move into the position illustrated in Fig. 3, the cutting edges 47, 50, cooperate to trim the waste material and cut the ring to exact size. During the downward stroke of the movable member 10 of the press, the auxiliary trimming member 45 is engaged by the cross web 34 of the housing so that the parts move as a unit to perform this cutting operation.

In the operation of the apparatus thus far described, the sheet material 11 from which the ring or annular member is to be formed. is fed by hand or otherwise into a position over the hollow or cup-shaped mold 15 resting upon the supporting plate 18 in the manner illustrated in Fig. 1. The material is fed to this position at a time in the cycle of operation of the machine when the movable mem-

ber 10 is in its raised position. Then the operator depresses the controlling clutch in the usual manner to cause the movable member 10 to be depressed, and as the parts carried thereby descend into the position illustrated in Fig. 3, the sheet material is cut to an approximate size by the cooperation of the cutting edges on the cutting die 40 and the outer edge 42 of the cup-shaped mold 15, and then as the parts continue to descend, the disk thus formed is forced down into the mold by the molding member 20, the marginal portion of the disk being bent into cylindrical shape and forming an annular shaped portion extending around the periphery of the cylindrical member 20 and between it and the internal wall of the mold 15. As the parts descend, the disk of material forming the bottom of the annular shaped portion is engaged between the lower surface 33 of the molding element 20 and the upper surface 25 of the hollow plunger 26, the latter having been held by the friction of the parts in the position illustrated in Fig. 1 from the previous cycle of operation, and as the parts continue to descend the hollow plunger 26 is forced down by the molding element 20 with the partially molded ring still held between the upper and lower surfaces of the plunger and molding element respectively. During this movement, the cutting edge 47 upon the auxiliary trimming member 45 passes the cutting edge 50 on the upper end of the mold 15, thus trimming the waste material from the rim of the annular portion and reducing the ring to finished size (see Fig. 3). After the ring has been thus trimmed to size by the trimmer 45, the parts and the trimmed ring continue to be moved downwardly into the mold until the hollow plunger 26 seats upon the surface 31. The movement of the movable member 10 of the press is designed to cause the molding element 20 and associated parts carried by the movable member 10, to move downwardly a short distance after the hollow plunger 26 is seated upon the surface 31, to thereby compress and mold the disk of material held between the upper and lower surfaces of the plunger 26 and molding element 20, respectively, and also to enable the cutting die 30 to die out the central portion of said disk to form the opening 27 in the finished ring. During this movement of the parts the material comprising the annular wall 55 (Fig. 2) of the ring is compressed by the downward movement of the blunt end of the narrow wall 46 of the trimmer 45 between the outer surface of the molding element 20 and the internal wall of the mold 15, and is thus molded to exact height. It will be understood that suitable clearances may be provided to accommodate the cutter dies to the character and thickness of the sheet material 11.

After the commutator ring has thus been formed, the movable member 10 of the press rises and provision is made for either ejecting the ring from the bottom of the cup-shaped mold 15, or for lifting it to a position from which it may be readily removed by the operator, and also in the event that the finished ring has adhered to the projecting die 20, for stripping the ring therefrom. For these purposes, provision is made for mechanically raising the plunger 26 into the position illustrated in Fig. 1 through a positively timed crank 60 upon the main cam shaft 14, operating through the connecting rod 62 and nut 63 upon the lower end thereof to oscillate a lever arm 64 loosely and pivotally mounted upon a pin 65 upon a lug 66 secured to the machine frame, to raise a contact plate 67 and through the rods 68 secured thereto, to lift the plunger 26 as will be apparent from inspection of Fig. 1. The crank 60 is preferably timed with relation to the normal movement of the movable member 10 to permit the plunger 26 to be moved downwardly by the projecting die 20, as above described. When the plunger 26 is raised in the manner described, any molded ring which may have adhered to the bottom of the cup-shaped mold 15 is raised into a position from which it may be readily removed from the mold by an operator. In the event that the ring has adhered to the projecting die 20, provision is made for depressing the auxiliary trimmer 45, thus causing the blunt end of the narrow wall 46 of the trimmer to strip the ring from the projecting die 20. For this purpose, the trimmer 45 is carried by bolts 70 secured to the flange 71 of a head 72 and which are slidably extended through holes in the cross web 34 of the housing 35. The head 72 is centrally bored to receive an expansion spring 73 interposed between it and the cross web 34 and which operates to normally raise the head and consequently the trimmer 45 into the position illustrated in Fig. 3 in which the trimmer 45 abuts the lower surface of the cross web 34. When the movable member 10 nears the top of its stroke, the upper end of the head 72 is arranged to engage a knock-off lever 74 fixed to the machine frame and by which the head 72 and consequently the trimmer 45 is depressed or slid from the inner to the outer end of the projecting die during the remainder of the upward stroke of the movable member 10, thus causing the blunt end of the trimmer to engage the adhering commutator ring and strip it from its position upon the projecting die 20.

In order to remove any waste trimmings produced by the operation of the auxiliary trimmer 45 which may accumulate in the annular chamber below the trimmer 45 and within the cutting die 40, provision is made for blowing compressed air downwardly through openings 80 (see Fig. 5) in the trim-

mer 45. For this purpose, compressed air from any convenient source of supply is introduced through a supply pipe 81 into the chamber 82 within the housing 35 above the cross web 34. The compressed air is permitted to pass from the chamber 82 through openings 83, 84 (see Figs. 1 and 4) in the flange 71 and cross web 34, down into the annular chamber above the trimmer 45 and thence, as above described, through the holes 80 in the trimmer 45.

Provision is also preferably made for cooling the molding members and the cutting dies and also the material itself during the formation of the ring. For this purpose, the annular chamber 85 within the lower portion of the housing 35 may be connected by a pipe 86 with any convenient source of water supply. In addition, a conduit 87 for cooling water is provided in the stationary portion 17 and through which cooling water may flow from a supply pipe 88. In the formation of commutator rings from laminated mica sheets in which cementitious material is employed for uniting the laminations, it is desirable to cool the operating parts as well as the material in order to reduce to a minimum the tendency of adherence of the rings to the operating parts of the machine. Those skilled in the art will recognize that an important feature of the present invention resides in the configuration of the molding elements, when using the die-press to produce Ford commutator rings, but that in its broader aspects the features that enable articles of exact size to be produced may be employed with molds for producing other articles of widely differing shapes. It also will be understood that the outer die for cutting a disk from sheet material is not essential, since it is within the scope of the present invention to present previously cut disks of moldable material to the molds for their operation thereon.

In the illustrated apparatus the molding members and cutting dies are made circular in section in order to form commutator rings of the character shown in Fig. 2, although it is not desired to limit the invention in this respect, and while the preferred embodiment of the invention has been illustrated and described, it is to be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:—

1. In a machine of the character described, in combination, means for forming an annular shaped portion in a moldable sheet, comprising a hollow mold having a bottom slidable on the internal wall thereof and having a portion tapering toward the center and mouth of the mold, forming an internal shoulder spaced from the said internal wall and a complementary shaped molding element adapted to fit into the mold, and cooperate with the

internal shoulder, and means for relatively moving the mold and molding element.

2. In a machine of the character described, in combination, a hollow cylindrical mold, a plunger movable within the mold and having its upper surface forming an internal shoulder spaced from the mouth of the mold, a molding element capable, upon relative movement thereof with the mold, of fitting into the latter and cooperating with the internal shoulder, and means for moving the plunger toward the mold to eject molded material from the mold.

3. Apparatus of the character described, having in combination, a stationary mold, a reciprocatory member, a cylindrical molding element carried by said member and capable of movement into the mold, and cylindrical cutting dies carried by said member arranged around said molding element and adapted to cooperate with the outer and inner edges of the upper surface of the mold.

4. Apparatus of the character described, having in combination, a frame, a stationary member affixed to the frame, a hollow cylindrical mold secured to said member, a hollow plunger within said cylindrical mold having its upper surface tapered to form a raised bottom for the mold, a reciprocatory member, a cylindrical molding element carried thereby and capable of movement into the mold and having its lower surface complementary in shape to the upper surface of said hollow plunger, an outer cutting die adapted to cooperate with the outer edge of the upper surface of the mold for trimming a sheet to approximate size, and an auxiliary trimming member between said outer cutting die and the molding element, having a portion adapted to compress the annular member into the space between the lateral walls of the mold and molding element.

5. Apparatus of the character described, having in combination, a frame, a stationary member affixed to the frame, a hollow cylindrical mold secured to said member, a hollow plunger within said cylindrical mold having its upper surface tapered to form a raised bottom for the mold, a reciprocatory member, a cylindrical molding element carried thereby and capable of movement into the mold and having its lower surface complementary in shape to the upper surface of said hollow plunger, an outer cutting die cooperating with the outer edge of the upper surface of the mold for trimming a sheet to approximate size, and an auxiliary trimming member between said outer trimmer and molding element, having a portion adapted to compress the annular member in the space between the mold and molding element, and means for automatically raising the hollow plunger to eject an annular member from the mold.

6. Apparatus of the character described,

having in combination, a stationary hollow mold, a reciprocatory member, a cylindrical molding element carried by said member, an outer cylindrical cutting die mounted on the reciprocatory member and arranged about said molding element, an auxiliary trimmer mounted between said outer cutting die and molding element, and means for moving the auxiliary trimmer with relation to the molding element for stripping a molded member adhering thereto.

7. Apparatus of the character described, having in combination, a mold, means for cutting a disk from a moldable sheet and forcing it into the mold including a molding element capable of movement into the mold, a trimmer mounted to move with said molding element, and means for directing an air blast upon the trimmed material for discharging the same from the trimmer.

8. Apparatus of the character described, having in combination, a mold, means for cutting a disk from a moldable sheet and forcing it into the mold including a molding element capable of movement into the mold, a trimmer mounted to move with said molding element during the molding operation, and means for thereafter moving the trimmer with relation to the molding element for ejecting a molded member adhering thereto.

9. In a machine of the character described, in combination, a hollow mold having a bottom comprising a peripheral shoulder from which an inner surface rises obliquely the inclination thereof being toward the mouth and center of the mold, and surrounds a central opening in the bottom, an opposed molding element having a surface complementary in shape to said oblique surface of the hollow mold that surrounds a central element adapted to enter said central opening and lies within an outer element that registers with said shoulder and is movable relatively to said molding element, and means for causing said molding element and its associated parts to enter within the hollow mold.

10. Apparatus of the character described having, in combination, a cylindrical mold, means for forcing a disk of moldable sheet material into the mold to form a cup-shaped article, means for cutting a disk from the bottom of said article, means for trimming its peripheral wall, and means for molding said wall to an even height.

11. A machine for making insulating rings, having a recessed die, a receding die which when depressed forms an annular groove in conjunction with the recessed die, and an annular projecting die for forcing the work sheets into said groove formed by the recessed and receding dies.

12. A machine for making insulating rings comprising a hollow cylindrical mold having a circumferential outer ledge for supporting a work sheet and a circumferential inner

shoulder, an annular receding die which when depressed forms an annular channel in conjunction with said inner shoulder, an annular projecting die for forcing the work sheet into the channel formed by the mold and receding die, and an annular member surrounding the projecting die for entering the mold and finishing the work sheet as the receding die descends.

13. Apparatus of the character described comprising a hollow cylindrical mold having a circumferential ledge, means for holding a disk of moldable sheet material on said ledge in position to be received centrally within said mold, a projecting die and a co-operating die within said mold having annular inclined faces for firmly gripping said disk to form it with a substantially V-shaped circumferential bend in its outer portion, and a portion on one of said dies for cutting away the central portion of said molded sheet to form a ring.

14. A machine for making insulating rings having an annular channel comprising, a recessed die, a receding die which when depressed forms an annular channel in conjunction with the recessed die, a projecting die movable into and out of said recessed die and co-operating with said depressed receding die to mold said ring from interposed moldable sheet material, and means operated by the movement of the projecting die out of the recessed die for raising the receding die within the recessed die to eject the molded ring.

15. A machine for making insulating rings having, in combination, a recessed die, a receding die which when depressed forms an annular groove in conjunction with the recessed die, an annular projecting die for forcing moldable sheet material into said annular groove, and an annular member surrounding the projecting die for engaging and finishing the edge of the molded ring.

16. A machine for making insulating rings having, in combination, a recessed die, a receding die which when depressed forms an annular groove in conjunction with the recessed die, an annular projecting die for forcing moldable sheet material into said annular groove, and an annular member slidably mounted on the projecting die having a blunt lower end forming a shoulder for engaging and finishing the edge of the molded ring.

17. A machine for making commutator rings having, in combination, a hollow cylindrical mold and a reciprocating projecting die having molding surfaces shaped to cooperate and mold a commutator ring from moldable sheet material, and a member movably mounted on the projecting die and operated automatically by the withdrawing movement thereof for removing a molded ring therefrom.

18. Apparatus of the character described having, in combination, a male and a female mold having molding surfaces shaped to engage and form a cup-shaped article from moldable sheet material, an annular sleeve slidable on the male mold, means for holding said sleeve remote from the operative end of said male mold while in molding engagement with said female mold, and means operated by the disengagement of said molds for sliding said sleeve forward toward the operative end of said male mold.

19. Apparatus of the character described having, in combination, a hollow mold, a projecting die movable to force moldable sheet material into said mold to form a commutator ring and then withdraw from said mold, a movable sleeve on the projecting die, means to hold said sleeve at the inner end of said die during the molding operation, and means controlled by the withdrawal of the projecting die operating to move said sleeve during said withdrawal along said die from the inner to the outer end thereof.

20. Apparatus of the character described having, in combination, a reciprocating projecting die having an annular end molding surface, an annular sleeve on said die, a hollow head secured to said sleeve, an expansion spring in said hollow head acting to hold said sleeve at the inner end of said projecting die when said die is in molding position, a hollow mold with which said projecting die cooperates to form a commutator ring from moldable sheet material, and means engaged by said hollow head during the withdrawal of the projecting die from said mold acting to compress said spring and advance said sleeve along the die.

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