

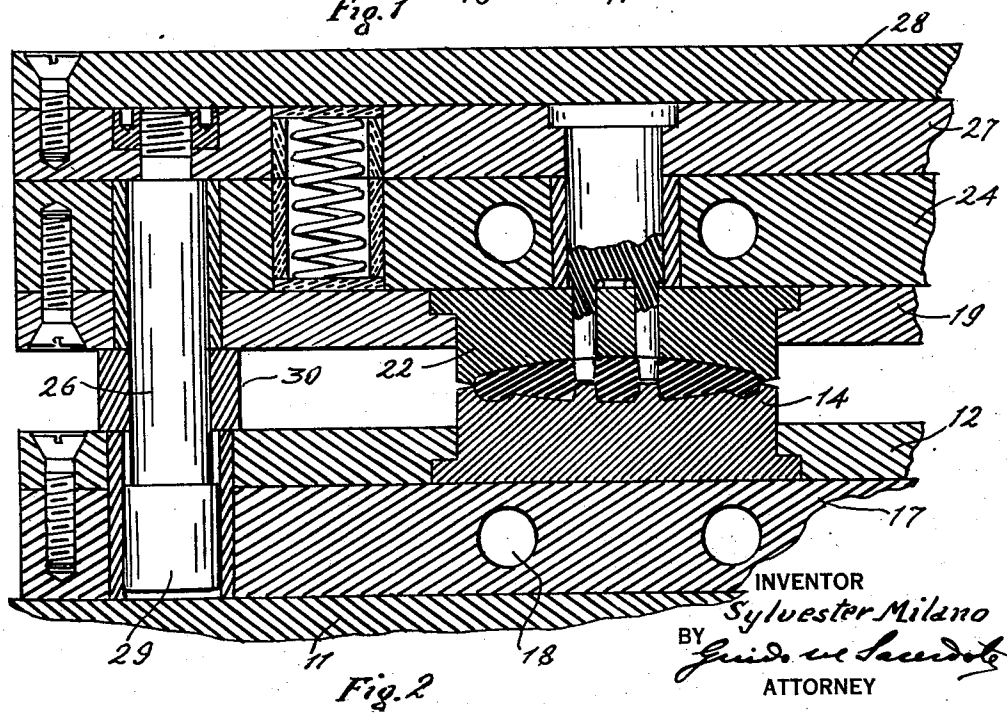
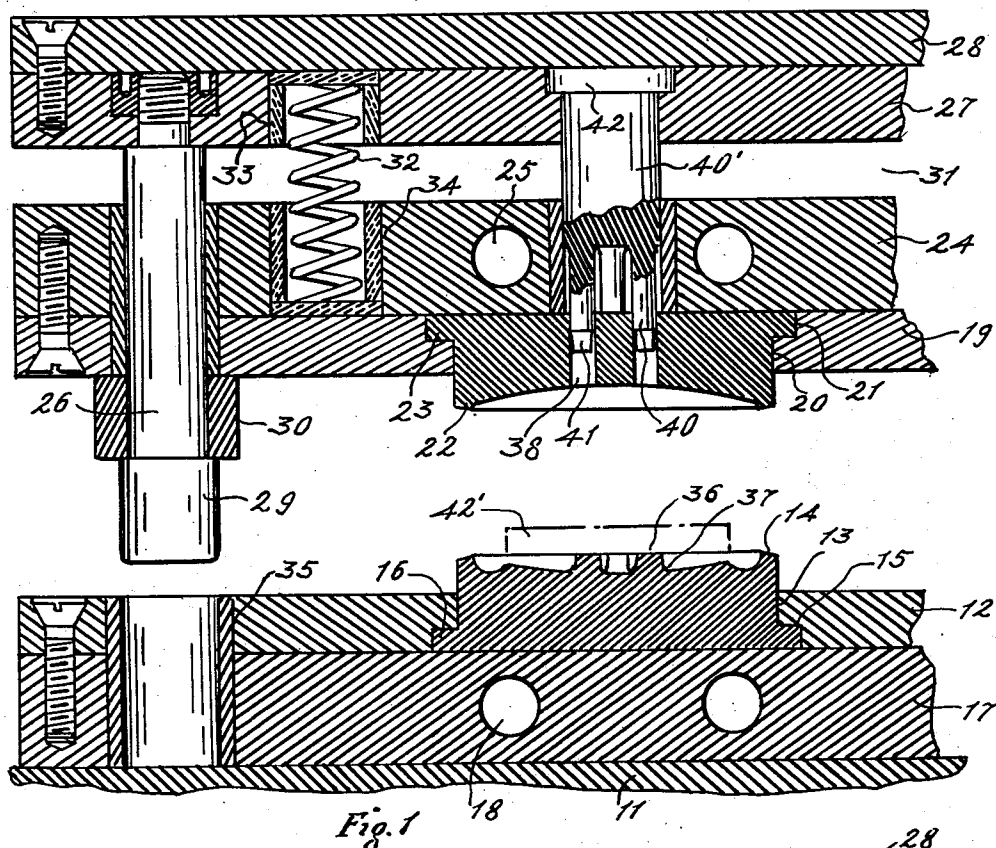
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APPARATUS FOR PRODUCING MOLDED PLASTIC ARTICLES

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APPARATUS FOR PRODUCING MOLDED PLASTIC ARTICLES

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11 Claims. (Cl. 18—42)

This invention relates to the art of producing articles from thermoplastic and thermosetting materials, such as artificial resins, and more particularly refers to a novel and improved type of die for molding buttons and other articles provided with holes which are desirably produced at the same time as the molding operation is completed.

In the art of molding buttons it is customary to compress suitable molding material between two sections of a suitably shaped die, while subjecting the material to the action of heat to render the material plastic and thus causing it to take the shape of the cavity formed by the two sections of the die when closed together.

It is also customary to provide these dies with pins penetrating the plastic mass to form thread holes at the same time that the material is subjected to the action of heat and pressure. In some types of dies one of the sections is provided with pins long enough to project beyond the thickness of the button and into corresponding holes provided in the other die section.

In another type of die only one section of the die is provided with pins extending substantially through the entire thickness of the body of the button without going beyond said body, so that easily breakable thin films will be formed at the back of the button, which films may be removed by a subsequent tumbling operation.

In still another type of die both sections are provided with pins meeting about halfway of the body of the button when the two sections of the die are closed.

In a copending application for patent entitled Method of producing molded plastic articles, Serial No. 410,308, filed simultaneously herewith, I have explained how by forming thread holes in the body of a button at the same time that the molding operation is performed, a serious loss of material is incurred because of cracking of the preformed tablets and distorting of the sprayed or stenciled design thereon due to the pins being forced into the material before said material has become sufficiently plastic. In said application I have described and claimed a method whereby this wastage may be practically eliminated and the quality of the product improved by subjecting the material to pressure after it has had a chance to become fused between the two sections of the die so as to have reached a sufficiently plastic condition.

In the same application, in order to provide a correct understanding of the principles under-

lying the invention, I have also described, but not claimed, a type of die adapted to carry the method into practice.

The primary object of the present invention is to provide a die of a novel and improved construction, representing the preferred type of die for carrying the aforesaid method into practice.

Another object is to provide a die of a novel and improved construction designed so that all of its parts will be easily accessible for maintenance and repairs, said die comprising individual die units adapted to be replaced by other units, interchangeable therewith, for the production of buttons and other articles of different shapes.

Other objects and advantages of the present invention will more fully appear as the description proceeds and will be set forth and claimed in the appended claims.

My invention is illustrated by way of example in the accompanying drawing, in which:

Fig. 1 is a fragmentary sectional view of a die embodying my invention, with its two sections apart ready to be moved to their closed position; and

Fig. 2 is a similar view showing the various parts of the die after its two sections have reached the closed position and the thread hole producing pins have penetrated through the mass.

My improved die comprises a lower section fixed on the movable press plate 11 and an upper section consisting of a stationary portion fixed to the upper plate (not shown) of the press and a floating portion carried by guiding pins depending from said stationary portion, said guiding pins acting as suspension members for said floating portion.

The lower section consists of a retaining plate 12 provided with a number of housings 13, each adapted to snugly receive a lower unit die section 14. The lower end of the housings 13 has an enlarged diameter to provide a peripheral shoulder 15, and the unit die section is correspondingly provided with a peripheral flange 16 registering with said shoulder and acting to retain the unit die section in position.

The lower section further comprises a backing plate 17 secured to the underside of the retaining plate and mounted on the lower press plate 11, said backing plate being provided with steam passages 18, which may be suitably connected to a steam supply system, in order to maintain the die section at a sufficiently high

temperature to fuse the plastic material placed in the die.

The floating portion of the upper section of the die similarly comprises a retaining plate 19 provided with housings 20 registering with housings 13 of the lower retaining plate, said housings 20 being formed with a retaining peripheral shoulder 21 and being adapted to snugly receive the upper unit die sections 22 which are also provided with a peripheral retaining flange 23. Said upper section also comprises a backing plate 24 secured to the retaining plate 19 and is provided with steam passages 25, maintaining the upper die section at the required temperature.

As stated, the floating portion of the upper die section is slidably supported by guiding pins, such as 26, depending from said upper press plate. To this end, the upper press plate 10 is equipped with a punch and guiding pin retaining plate 27, which is secured thereto through the intermediary of a backing plate 28.

The guiding pins 26 extend downwardly from said plate 27 and are formed with a lower head portion 29 having an enlarged diameter and forming a rest for a spacing bushing 30 interposed between said head and the retaining plate 19. The weight of the floating portion 19-24 will normally hold said portion in its lower or extended position in which it is supported by the spacing bushings 30 and is spaced a certain distance from the plate 27, as indicated at 31.

However, in practice, I prefer to also provide arrangements to help release the die from the stationary plate, for instance, springs, such as 32, interposed between the stationary and floating portions of the upper die section, said springs serving to gradually increase the working pressure when the floating portion 19-24 is forced against the stationary plate 27. Said springs are preferably encased in heat insulating housings 33, 34, in order to prevent their being adversely affected by the action of heat.

The head portion 29 of the guiding pins 26 registers with corresponding bushings 35 provided in the lower die section for the purpose of properly aligning the unit die sections when the lower die section is forced upwardly against the upper die section by the action of the press.

The unit die sections, or molds, shown, are of the type in which the thread holes in the button are produced by pins extending within the plastic mass from both sides, said pins almost meeting at a point about midway of the thickness of the button. The lower unit die section is accordingly formed with pins 36 upwardly extending a relatively short distance from the bottom thereof, said pins being slightly tapered from top to bottom and being connected to the bottom of the unit by rounded fillets 37.

The upper unit die section is provided with openings 38 registering with pins 36 of the lower unit die section, said openings forming passages for stems 40 formed integral with and depending in a cluster from a punch 40', the lower end of said stems being tapered to form thread hole forming pins 41, adapted to complete the holes generated by pins 36.

Said punch 40' is retained in position between retaining plate 27 and backing plate 28 by an enlarged head 42 registering with a corresponding opening formed in the retaining plate 27.

The unit die sections 14, 22 project a certain distance from their respective retaining plates

12, 19, said distance being such that when the two unit sections exactly meet, the distance between retaining plates 12 and 19 will correspond to the length of spacing bushings 30.

When the die is in the open position, shown in Fig. 1, the previously prepared tablets of plastic material are placed within the lower unit die sections, as shown at 42'. Said tablets are produced by means of a special machine delivering them in compressed solid form so that they can be easily and speedily handled.

The press is then operated to slowly raise the lower die section towards the upper section while the tablets of plastic material are gradually reduced to a plastic condition by the heat transmitted from the steam passages to the unit die sections.

When the upper surface of the tablet comes in contact with the surface of the upper unit die section, if the tablet has not yet softened to a material degree, the floating upper section will be forced upwardly until the plastic material having finally become fused, the two unit die sections will be enabled to meet and shape the body of the button. At the same time, the lower portion of the die will continue to rise, forcing the floating upper section upwardly against the action of springs 32, the pressure from the lower to the upper section being transmitted through spacing bushings 30 so as to relieve the unit die sections of any extra pressure.

As the floating upper section continues to move towards plate 27, pin portions 41 of stems 40 will gradually emerge from openings 36 in the upper unit die section until, when backing plate 24 finally comes to abut against retaining plate 27, as shown in Fig. 2, pin portions 41, together with pins 36 of the lower unit die section, will have formed the thread holes in the button, leaving a very thin wall of plastic material across such holes, as Fig. 2 clearly shows.

Due to the shape of the pins, the thread holes thus produced will be slightly flaring and with rounded edges at both ends, so that the button can be sewed in place without difficulty and the rounded edges will be easy on the thread.

It will be observed that by virtue of the construction described, the thread hole forming pins cannot be forced through the molding material until such material has reached a sufficiently plastic state. The press piston moves at a relatively slow pace so that after the tablets of molding material have become clamped between the two unit die sections there is ample time for such material to become fused or plastic before the thread hole forming pins are actually forced through it. As a result of the conditions thus created the plastic material can be formed exactly to shape and pressed about the thread hole forming pins without danger of breakage or cracking of the preformed tablet, whether sprayed, stenciled, or of one color, and a perfectly smooth product of uniform texture is obtained.

It is, of course, understood that the thin film of material produced across the thread holes can be subsequently removed by suitable operations.

It is thus apparent that by virtue of my invention I insure conditions whereby no undue strain is placed on the molding material while said material is still in a relatively solid state, so that the material is reduced to the best conditions of plasticity before any actual forming or piercing operations are performed upon it. Due to the conditions thus created, I also make

it possible to produce holes with smooth surfaces

and rounded edges without the necessity of using special reaming or drilling tools.

Minor constructional details of my invention may vary from those shown without departing from the inventive idea. The drawing should, therefore, be understood as being intended for illustrative purposes only and not in a limiting sense.

I, accordingly, reserve the right to carry my invention into practice in all those ways and manners which may enter, fairly, into the scope of the appended claims.

I claim:

1. A sectional mold of the character described, comprising two cooperating sections, one of said sections having a fixed portion with guiding pins extending therefrom and a floating portion mounted on said guiding pins and normally movable towards and against said fixed portion under the action of pressure the other of said sections having recesses to receive said guide pins to hold said sections accurately in registry, and a punch extending from said fixed portion through said floating portion, whereby when molding material is clamped between said two sections while being subjected to the action of heat, said material may be reduced to a certain degree of plasticity before full forming pressure is applied thereto as said floating portion comes to rest against said fixed portion with said pins in said recesses, and before said punch may emerge from said floating portion and penetrate said material, said sections being provided with passages through which a heating fluid may be supplied thereto.

2. A sectional mold of the character described, comprising a lower section consisting of a base plate and a unit die section secured thereto, and an upper section comprising a retaining plate, guiding pins depending therefrom, said pins being provided with an enlarged head, a spacing bushing resting on said head, and a floating portion having a backing plate and an upper unit die section secured thereto, registering with and cooperating with the lower unit die section, said floating portion being mounted in telescopic relation with said guiding pins and being supported by said bushings when in its extended position.

3. A sectional mold of the character described, comprising a lower section consisting of a base plate and a unit die section secured thereto, and an upper section comprising a retaining plate, guiding pins depending therefrom, said pins being provided with an enlarged head, a spacing bushing resting on said head, and a floating portion having a backing plate and an upper unit die section secured thereto, registering with and cooperating with the lower unit die section, said floating portion being mounted in telescopic relation with said guiding pins and being supported by said bushings when in its extended position, said base plate and backing plate being provided with passages through which a heating fluid may be supplied thereto.

4. A sectional mold of the character described, comprising a lower section consisting of a base plate and a unit die section secured thereto, and an upper section comprising a retaining plate, guiding pins depending therefrom, said pins being provided with an enlarged head, a spacing bushing resting on said head, a floating portion having a backing plate and an upper unit die section secured thereto, registering with and cooperating with the lower unit die section, said floating portion being mounted in telescopic relation with

said guiding pins and being supported by said bushings when in its extended position, said base plate and backing plate being provided with passages through which a heating fluid may be supplied thereto, and springs interposed between said retaining plate and backing plate, urging said floating portion to its extended position.

5. A sectional mold of the character described, comprising a lower section consisting of a base plate and a unit die section secured thereto, and an upper section comprising a retaining plate, guiding pins depending therefrom, said pins being provided with an enlarged head, a spacing bushing resting on said head, a floating portion having a backing plate and an upper unit die section secured thereto, registering with and cooperating with the lower unit die section, said floating portion being mounted in telescopic relation with said guiding pins and being supported by said bushings when in its extended position, and a punch extending from said retaining plate through said backing plate and upper unit die section, said punch penetrating into the molding material held between said two unit sections, when said lower section forces said floating portion of the upper section towards and against said backing plate.

6. A sectional mold of the character described, comprising a lower section consisting of a base plate and a unit die section secured thereto, and an upper section comprising a retaining plate, guiding pins depending therefrom, said pins being provided with an enlarged head, a spacing bushing resting on said head, a floating portion having a backing plate and an upper unit die section secured thereto, registering with and cooperating with the lower unit die section, said floating portion being mounted in telescopic relation with said guiding pins and being supported by said bushings when in its extended position, and a punch extending from said retaining plate through said backing plate and upper unit die section, said punch penetrating through molding material held between said two unit sections, when said lower section forces said floating portion of the upper section towards and against said backing plate, said base plate and backing plate being provided with passages through which a heating fluid may be supplied thereto.

7. A sectional mold of the character described, comprising a lower section consisting of a base plate and a unit die section secured thereto, and an upper section comprising a retaining plate, guiding pins depending therefrom, said pins being provided with an enlarged head, a spacing bushing resting on said head, a floating portion having a backing plate and an upper unit die section secured thereto, registering with and cooperating with the lower unit die section, said floating portion being mounted in telescopic relation with said guiding pins and being supported by said bushings when in its extended position, a punch extending from said retaining plate through said backing plate and upper unit die section, said punch penetrating through molding material held between said two unit sections, when said lower section forces said floating portion of the upper section towards and against said backing plate, said base plate and backing plate being provided with passages through which a heating fluid may be supplied thereto, and springs interposed between said retaining plate and backing plate, urging said floating portion to its extended position.

8. A sectional mold for producing buttons, com-

prising a lower section consisting of a base plate and a unit die section secured thereto, and an upper section comprising a retaining plate, guiding pins depending therefrom, said pins being provided with an enlarged head, a spacing bushing resting on said head, a floating portion having a backing plate and an upper unit die section secured thereto, registering with and cooperating with the lower unit die section in molding a button therebetween, said floating portion being mounted in telescopic relation to said guiding pins and being supported by said bushings when in its extended position, and a punch having its lower end formed with a cluster of thread hole forming pins, extending through said backing plate and upper die section, said pins penetrating the button material held between said two unit sections, when said lower section forces said floating portion of the upper section towards and against said backing plate.

9. A sectional mold for producing buttons, comprising a lower section consisting of a base plate and a unit die section secured thereto, and an upper section comprising a retaining plate, guiding pins depending therefrom, said pins being provided with an enlarged head, a spacing bushing resting on said head, a floating portion having a backing plate and an upper unit die section secured thereto, registering with and cooperating with the lower unit die section in molding a button therebetween, said floating portion being mounted in telescopic relation to said guiding pins and being supported by said bushings when in its extended position, and a punch having its lower end formed with a cluster of thread hole forming pins, extending through said backing plate and upper die section, said pins penetrating about half way through the button material held between said two unit sections, when said lower section forces said floating portion of the upper section towards and against said backing plate, said lower unit die section having a cluster of pins registering with said punch pins, extending through the remainder of the thickness of said button material, to complete the thread holes therethrough.

10. A sectional mold for producing buttons, comprising a lower section consisting of a base plate and a unit die section secured thereto, and an upper section comprising a retaining plate, guiding pins depending therefrom, said pins being

provided with an enlarged head, a spacing bushing resting on said head, a floating portion having a backing plate and an upper unit die section secured thereto, registering with and cooperating with the lower unit die section in molding a button therebetween, said floating portion being mounted in telescopic relation to said guiding pins and being supported by said bushings when in its extended position, and a punch having its lower end formed with a cluster of thread hole forming pins, extending through said backing plate and upper die section, said pins penetrating about half way through the button material held between said two unit sections, when said lower section forces said floating portion of the upper section towards and against said backing plate, said lower unit die section having a cluster of pins registering with said punch pins, extending through the remainder of the thickness of said button material, to complete the thread holes therethrough, said base plate and backing plate being provided with passages through which a heating fluid may be supplied thereto.

11. A sectional mold of the character described, comprising two cooperating sections, one of said sections having a fixed portion and a floating portion, guiding pins rigidly fixed in one of said portions and slidably mounted in the other of said portions to permit said floating portion to move toward and against said fixed portion under the action of pressure, said guiding pin having enlargements which limit the movement of the floating portion away from the fixed portion, said cooperating sections having interfitting means for accurately aligning said sections when they are brought to closed position, a punch extending from said fixed portion through said floating portion, whereby when molding material is clamped between said two sections while being subjected to the action of heat, said material may be reduced to a certain degree of plasticity before full forming pressure is applied thereto as said floating portion comes to rest against said fixed portion with said aligning means retaining said section accurately in alignment, and before said punch may emerge from said floating portion and penetrate said material, said sections being provided with passages through which a heating fluid may be supplied thereto.

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