Sept. 6, 1932. M. DUVAL 1,875,712

MOLDING APPARATUS

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Fig. 1.

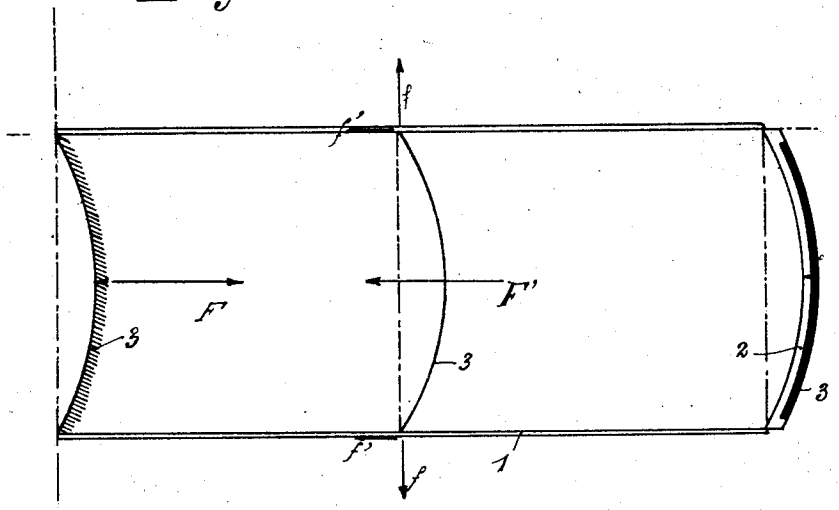
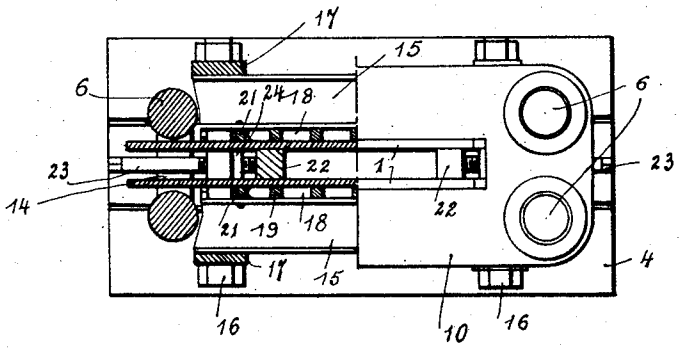



Fig. 4.




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Fig. 3.

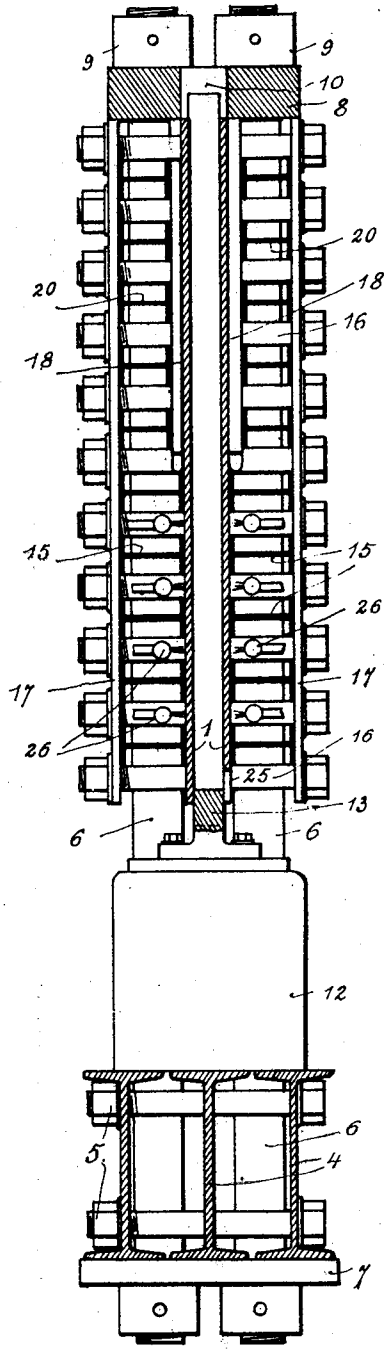
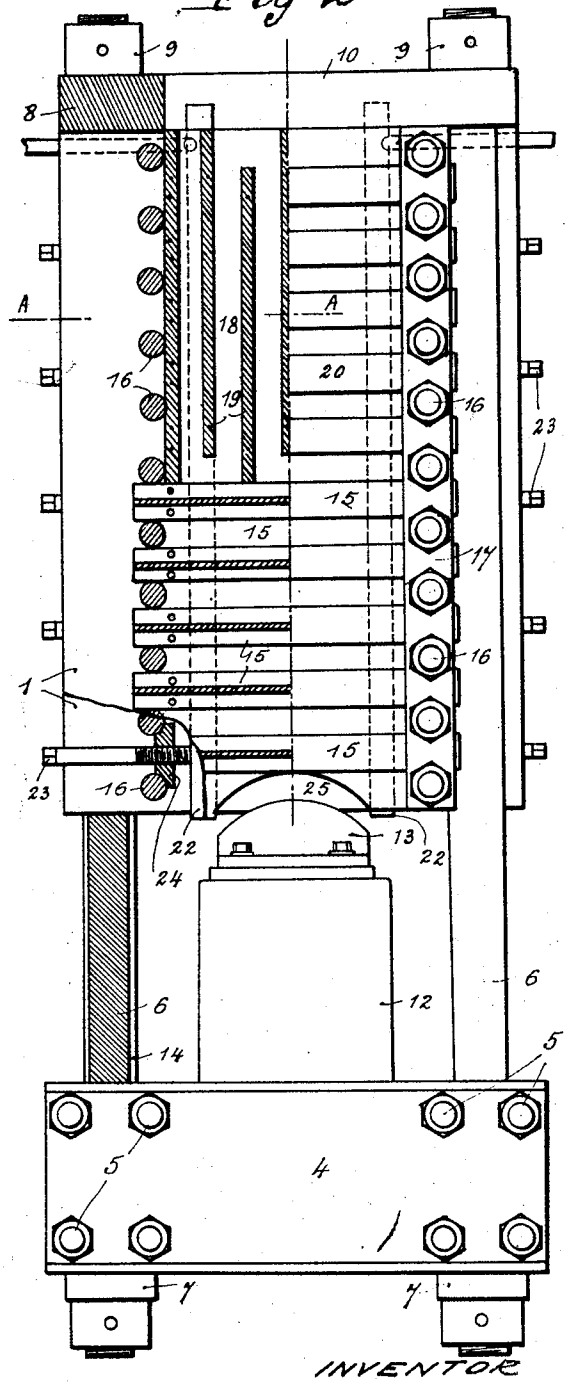



Fig 2




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# UNITED STATES PATENT OFFICE

MAURICE DUVAL, OF MONTSECRET, FRANCE

## MOLDING APPARATUS

Application filed June 22, 1928, Serial No. 287,560, and in France August 25, 1927.

The apparatus, the subject-matter of the invention, consists essentially in the use of the friction of the edges of the treated material against the walls of a chamber in which they are displaced, in order to produce braking efforts whereby their forward motion will be delayed. In these conditions, the efforts acting upon the said elements to effect their displacement, will cause axial pressures acting upon these latter, and these pressures, optionally combined with a variation of temperature, will reduce the volume of the treated material and give the latter its definite shape.

The material to be molded is placed in the treating chamber in a manner to exercise friction directly upon the walls of the said chamber, or to be combined with intermediate compressible plates applied upon the shaping matrices, in those instances where the said material, due to its fragility (or to its form) will not support the effort of friction upon the walls, or if by reason of a very small coefficient of friction it is necessary to employ excessive surfaces of friction.

To carry my said process into effect, I pile up a series of the pieces to be molded, in a conduit or chamber open at both ends. The cross section of said conduit may be varied by displacing its walls so as to modify if necessary the lateral efforts of adhesion. The said pieces may be separated by metal forms of a compressible nature, and their forward travel in the said conduit determined by introducing new pieces, by pressure, according as the assemblage of pieces moves forward. Due to the said device for continuous compression, with the successive feeding of superposed objects subjected to the same step of the treatment, I am enabled to use a machine requiring only the power necessary for the treatment of a single object. I further eliminate the use of molds consisting of several parts, which are very expensive, as well as all subsequent operations of removal from the mold, or the like.

In fact, the templates or molds consist of a single piece, and the pieces are automatically removed therefrom when issuing from the apparatus. An element placed at the top forms a cover for the lower part, and the friction plates form the sides of the mold. With this apparatus I obtain a large output of products and with a continuous operation. The apparatus is of simple construction and requires no upkeep. It provides for an entirely automatic functioning in the case of large output in standard sizes.

In the appended drawings which are given by way of example: Fig. 1 is a diagrammatic view showing the features of the process according to the invention.

Figure 2 is a view in elevation, partly in section, of the apparatus constructed in accordance with the invention.

Figure 3 is a view in section, partly in elevation, of the improved apparatus taken at right angles to that of Figure 2.

Figure 4 is a transverse section, partly in elevation, taken on the line A—A of Figure 2.

As above indicated, the said invention is characterized by the fact that the friction $f$ of the edges of the pieces to be molded 3, which are pressed into a chamber 1 is utilized to produce an effort $f'$ delaying the forward motion of said pieces. For this reason, the effort F, which acts to effect their displacement, produces an axial reaction F' effecting a compression between the superposed pieces. This compression optionally added to a variation of the temperature of the chamber, acts to give them a reduction of volume, a suitable form, and even a change in their physical state.

The pieces 3 are directly placed in the chamber 1 containing the shaping templates or forms 2, which templates may be so constructed that each face forms the front and rear faces of two adjacent pieces. In this manner, the said pieces, or the pieces together with their templates, will constitute a continuous series which is moved forward in the said chamber each time that a new piece is introduced by pressure. When the chamber is filled, the introduction of a new piece at one end will cause the exit of a finished piece at the other end, so that the proc-

ess will be carried out in a continuous manner.

The value of the friction on the walls of the chamber and hence the value of the pressure acting upon the said pieces may be regulated by varying the spacing of the whole or a part of the consecutive walls of the said chamber, or the parallel position of the said walls.

The apparatus whereby the said process can be carried into effect may be constructed in the form of a press, as shown in Figs. 2, 3 and 4.

For the manufacture of curved pieces for the facing of brakes, the said press consists of a lower base frame 4 comprising the I beams 4 in the parallel position and assembled by the cross bolts 5. The said bolts 5 are so combined as to hold and to guide the ends of the pairs of vertical rods 6 forming traction members. The lower heads of the said rods are in contact with the cross pieces 7 disposed below the lower base. At their upper part the said rods traverse the corresponding top support 8 and are secured thereto by the nuts 9. The said support (Fig. 4) consists of a rectangular plate carrying a central mortise 10 of the same form.

The lower base 4 carries the hydraulic cylinder 12 of the press, on which is mounted the movable template 13. Between the rods 6 are disposed two parallel vertical plates. The said plates rest at their lower edges upon spacing blocks 14, which are disposed between each pair of rods 6. The plates 1 rest by their upper edges upon the corresponding base 8, said plates being stiffened upon a part of their height by U irons 15 placed horizontally on each of their external faces. The said U irons 15 are held in position by the cross bolts 16 which traverse the plates 1 adjacent their lateral ends. The heads and nuts of said bolts are supported at one end upon the rulers 7, bearing upon the outer flanges of the strengthening iron members 15.

At the upper part, I may dispose adjacent the plates the closed chambers or jackets 18 adapted for the circulation of a cooling agent. The jackets 18 thus constitute cooling elements. Their walls are connected together in the interior by the spacing bars 19 which are vertically disposed; said bars are also arranged as shown on the left hand side of Fig. 2, in order to form baffles. Upon the external walls of the jackets 18 are also disposed the U iron members 20, whose height is less than that of the members 15, but which have a like disposition. Suitable spacing strips are placed along each of the vertical ends of the jackets to provide for the pressure of the bolts 16, as shown on the left of Fig. 4.

In the central space between the plates 1 are disposed at each end the vertical strips 22 which are slidable between the said plates 1, and said strips make contact with the horizontal adjustment screws 23. The said screws, whose heads extend on the lateral sides of the press, pass between the coupled rods 6. They are screwed upon the blocks 24 which form nuts. The said blocks, which are disposed between the parallel plates 1, are in contact with two transverse bolts 16.

One of the plates 1 carries at its lower part, and adjacent the template of the press, an aperture 25 providing for the lateral engagement of the metallic parts and for their packing in the chamber formed between the parallel plates 1 and the movable lateral bars 22.

The said plates 1 may be heated externally by the rows of gas burners 26 which have the parallel position between the bracing bars. In this manner the metallic parts will be inserted into the central chamber each time that after placing a new piece upon the template 13, the latter is raised by the action of the press. The set of pieces is first subjected to the action of a progressive heating by the burners 26, and then to the effect of a progressive cooling by the circulation in the cooling jacket 18. The rate of supply to the press may be variable, and I am enabled to modify at will the time during which the treated material remains in the chamber, and can thus regulate the regions and the duration of the application of heat and cold to which the said material may be successively subjected, as for instance in the treatment of bakelite.

The distance between the walls of the chambers formed by the bars 22 may be modified by acting upon the lateral pressure screws 23, and the same is true for the other faces formed by the plates 1.

The said apparatus may be provided with automatic means for supply.

I claim:

1. An apparatus for molding objects including a mold made up of plates spaced apart a distance corresponding to the width of the element, adjustable end plates to provide means for making the length less than the length of the object to be formed, and means for exerting pressure on the object to force said object through the mold.

2. An apparatus for molding objects including a mold made up of plates spaced apart in correspondence with the width of the element and end walls spaced apart a distance less than the length of the element, means for creating an initial pressure on the element at the entrance end of the mold whereby an element introduced into the mold is frictionally retarded at its ends while subjected to pressure to thereby compress the element, and adjustable screws connected to the end walls of the mold whereby the distance between the end walls may be varied,

thereby varying the frictional resistance between said walls and the ends of the object.

3. An apparatus for molding objects, including a mold made up of plates spaced apart in correspondence with the width of the element and end walls spaced apart a distance less than the length of the element, means for creating an initial pressure on the element at the entrance end of the mold whereby an element introduced into the mold is frictionally retarded at its ends while subjected to pressure to thereby compress the element, and means for adjusting the end walls of the mold to vary the frictional resistance between said walls and the ends of the element.

In testimony whereof I affix my signature.

MAURICE DUVAL.