Dec. 2, 1952 N. T. BALDANZA 2,619,679

INK RECORDATION ON MOLDING RESINOUS ARTICLES

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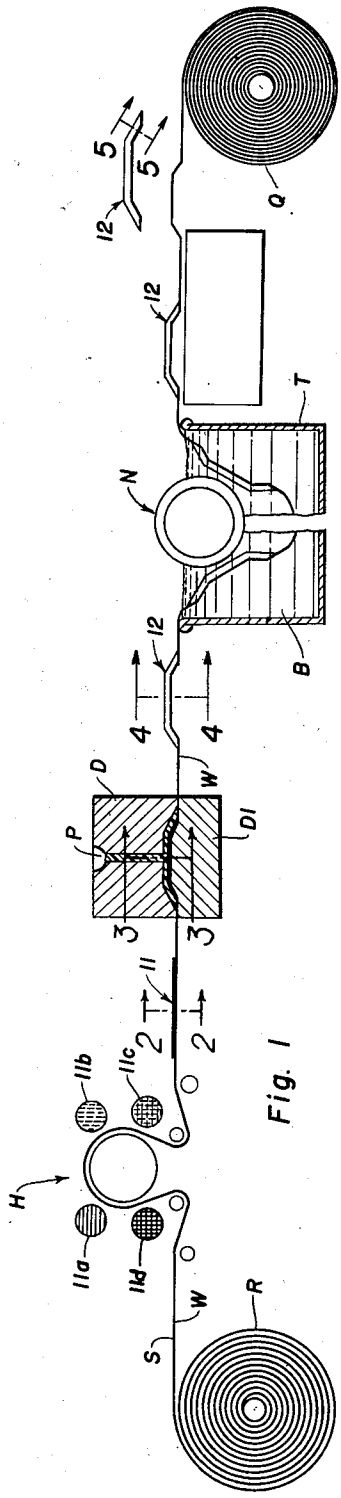


Fig. 1

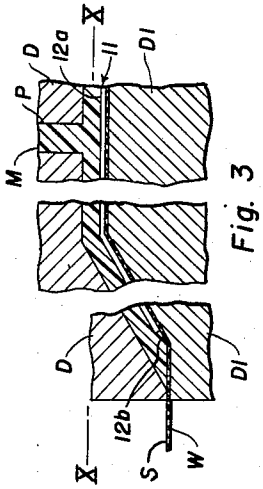


Fig. 3

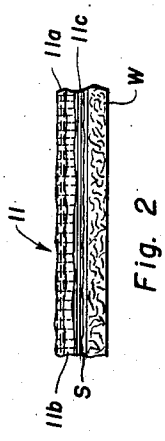


Fig. 2

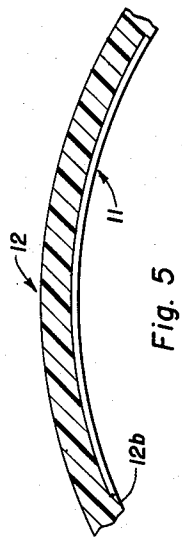


Fig. 5

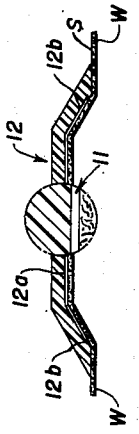


Fig. 4

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INK RECORDATION ON MOLDING RESINOUS ARTICLES

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1 Claim. (Cl. 18—47.5)

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This invention relates to printing or decorating with ink, paint or the like, in desired coloring on plastic resinous molded articles during the molding operation thereof, and more particularly the invention is directed to a novel method or process of applying printed matter or decorations in one or a plurality of desired colors to said plastic molded articles during a period from the time that the plastic material forming the article is in a fluid state under pressure until said plastic material solidifies and hardens making the printing or ornamentation an integral part thereof.

Among the objects of the invention is to generally improve methods and processes of the character described, which shall require few and simple means that are readily assembled or installed in plastic molding manufacture, which shall provide a cheap manufacture applicable to mass volume production, which shall provide simple operational steps requiring a minimum of material and skilled labor and particularly adaptable as an improvement to plastic molding manufacture, and which shall be practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out. The invention accordingly consists in the features of the method and steps of the process exemplified in the method hereinafter described, and of which the scope of application will be indicated in the claim following.

In the accompanying drawing in which a possible illustrative embodiment of the invention is shown;

Fig. 1 is a diagrammatic view showing a layout including steps for practising one method embodying the invention.

Fig. 2 is a fragmentary cross-sectional view greatly enlarged taken on line 2—2 in Fig. 1 showing the surface coated paper web with ink recordation thereon before the molding operation.

Fig. 3 is an enlarged cross-sectional view in fragments taken on line 3—3 in Fig. 1 showing the article being formed in the molding process in contact with ink recordations on the paper web, the relative proportions of the dies, article, paper and ink recordations being exaggerated for purposes of illustration.

Fig. 4 is an enlarged cross-sectional view taken on line 4—4 in Fig. 1 showing the article after being molded to the recordation and web, portions of the section being shown magnified, and

Fig. 5 is an enlarged cross-sectional view taken on lines 5—5 in Fig. 1 showing the ink recordations fused into the plastic article after removal from the web.

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Referring in detail to the drawing Fig. 1 shows generally a layout including the steps for practising a method embodying the invention which, as here shown, may employ suitable sheet material such as a flexible paper web W having a suitably treated coated surface S for carrying ink recordations 11 to be incorporated as surface markings, decorative or ornamental means on thermo-plastic resinous articles 12 during the molding thereof.

Web W may be provided from a suitable supply source as for example roll R, and the paper forming said web W may be such as conventionally used for production of popular illustrative magazines employing both various single color and multi-color printing as ink recordations 11. Said web paper W having a coated surface S, as for example a machine coated paper having principally a clay and starch base or other sizing material provided in the well understood manner, on which ink recordations 11 are carried in satisfactory "typography." The term "typography" is herein used to denote ink or other pigment recordations made by any one of the well known letterpress, lithographic or gravure printing processes.

The web paper W and coating S preferably may be of such character as to absorb water when immersed therein or applied thereto and the ink recordations 11 may be substantially of waterproof composition.

It is, however, contemplated in practising the invention to use where desired metallic or non-metallic sheet materials other than paper, either flexible or relatively rigid, which are preconditioned or coated if required to carry the ink recordations 11 and permit ready removal of the latter from such other sheet materials in the manner hereinafter described.

As seen from Figs. 1, 2 and 3, web W with ink recordations 11 while advancing pass between injection molding dies D, D1, die D having a centrally positioned sprue P through which a heated thermo-plastic resin M under pressure is supplied with the flexible sheet positioned against die D1 and ink recordations 11 facing said sprue P, so that, the resin M in heated fluid state is injected centrally and spreads over the ink recordations 11 under pressure to bake or fuse the latter in a desired position onto the material M which on and during solidification forms molded article 12 with the ink recordations 11.

As the web W with said article 12 molded thereon is further advanced beyond the dies D, D1,

they may pass through or be immersed in soaking tank T containing water bath B so that the paper and coating S of the web W upon absorbing water may thereafter be readily peeled from the article 12 to leave the ink recordations 11 intact thereon, there being provided a roller N to facilitate said immersion as is clear from Fig. 1.

The leading end of the paper with the article 12 removed may be disposed of in any suitable manner as by winding up in a waste or spent roll Q.

From the drawing and above description, the improved method of practising the invention will now be apparent.

Paper web W having said coated surface S has deposited or imprinted thereon ink recordations 11 which is desired to be applied to molded thermo-plastic article 12. If desired said ink recordations 11 may be applied by any of the said suitable typographic processes and is diagrammatically indicated in Fig. 1 by inked impression roller mechanism H positioned to operate between web supply roll R and mating mold dies D, D1. It is to be understood that, if desired ink recordations 11 may be separately or independently applied on said coated surface S and provided in a wound up roll web form like roll R and fed directly for the molding operation.

Web W with ink recordations 11, illustrated in cross-section in Fig. 2, may be fed between mold dies D, D1 while separated with the ink recordations 11 facing die D and centrally located with respect to sprue P as described above.

Article 12 as here shown in Fig. 1 has surface portion 12*a* lying substantially in a plane X—X and also has surface portion 12*b* which extends or lies beyond said plane X—X, that is, as here shown, in angular relation thereto, both surface portions 12*a* and 12*b* requiring ink recordations 11 to be applied thereto.

Where paper web W is made of flexible sheet material it may be distorted into the required shape and the ink recordations 11 brought into desired position on surface portions 12*a* and 12*b* during the molding operation. But where web W is less flexible portions thereof may be preformed to correspond to the shape of surface portions 12*a* and 12*b* and ink recordations 11 properly applied or printed thereon in any well understood manner.

On positioning the ink recordations 11 in a desired registered alignment with respect to the surfaces of article 12 to be molded, the mold dies D, D1 are closed and a thermo-plastic resin properly heated as for example polystyrene, "nylon" or other like material is injected in central sprue P against ink recordations 11 where it uniformly spreads under pressure forcing the ink recordations 11 onto either or both surfaces 12*a* and 12*b* in desired position where said recordations 11 are brought into a baked or fused adhesion thereagainst simultaneously with the molding of article 12 without bleeding or distortion of composition of the ink recordations 11 thereby providing a surface printing or decoration in one or a plurality of colors.

Where polystyrene is used it has been found that temperatures of the plastic ranging from 325° to 375° F. and pressures of 10,000 lbs. per sq. inch renders satisfactory results in carrying out the above described method, and ink recordations 11 may be made with any well known resin base ink having thermoplastic properties of limited compatibility with material M, that is, will fuse with material M but will be free from bleeding or

distortion to any visible degree, or other available printer's ink which have like or equivalent inherent characteristics.

In Figs. 1 and 2 the ink recordations 11 made by the so called letterpress printing method is shown being utilized for practicing the invention comprising colored inks such as yellow 11*a*, magenta 11*b* and blue-green 11*c*, and if desired also black ink 11*d* (not shown utilized in Fig. 2), superimposed in films or layers of about .00025 of an inch in thickness from which a wide range of color effects may be provided as is well understood in the printing art.

After said molding material in dies D and D1, solidifies as molded article 12 with said ink recordations 11, said dies D and D1 are separated and the web W advanced to register in alignment the next like successive ink recordations 11 between said dies D and D1 and the molding part of the cycle repeated as described above.

The leading solidified molded article 12 with ink recordations 11 which is still attached to web W may be immersed in water bath B contained in said tank T, where the paper portion and coating S of web W becomes thoroughly wet and saturated and after passing therethrough said web paper portion at the coating may be readily peeled off article 12 entirely free from the ink recordations 11 which remain intact on article 12.

Said web paper portion with the entire article 12 removed may be disposed of by winding same in a roll Q.

As shown in Fig. 2 where multi-color recordations 11 are utilized, the ink colorings 11*a*, 11*b* and 11*c* may be provided in reverse order so that upon transfer thereof during the molding operation of article 12, said ink colorings 11*a*, 11*b* and 11*c* wil lie in the recognized conventional order. However, various other orders have been found to give commercially acceptable results.

Although only letterpress printing is above described it is to be understood that lithographic or gravure printing may also be used or, if desired, the ink recordations 11 or the like may be hand applied to the sheet material and utilized in accordance with the method above described.

Where mass production methods are used the invention may be carried out as a continuous process with the web W as shown in Fig. 1, or if required for special purposes, separate sheets, preformed or flat, with ink recordations 11 may be inserted individually for the molding operation.

It will thus be seen that there is provided an improved method of ink recordation in molding plastic resinous articles in which the several objects of the invention are achieved and which are well adapted to meet the conditions of practical use.

As various possible embodiments of the invention may be made in the above invention and as various changes may be made in the embodiments and method above set forth, it is to be understood that all matters herein set forth and shown in the accompanying drawing are to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention I claim as new and desire to secure by Letters Patent:

A method of manufacturing in an intermittent process molded articles of polystyrene resin with predetermined surface markings in the form of an ink recordation of a resin base ink having thermoplastic properties of limited compatibility with said polystyrene, the steps of feeding a continuous web of flexible moisture absorbing sheet material with said ink recordation preformed on

spaced portions thereof between split open molding dies with the sheet material positioned against one die and the ink recordation facing the other die, positioning the ink recordation with respect to the article to be molded, closing the dies and injecting said polystyrene resin at a temperature ranging from 325° to 375° F. in a molten fluid condition centrally against said ink recordation to fill the molding dies under a pressure of substantially 10,000 lbs. per sq. inch for simultaneously uniting the ink recordation with the polystyrene resin on solidification during molding of said article, opening the dies and removing the completely molded article with the integral recordation while the web remains continuous during the molding operation, conveying the web while the molded article remains attached thereto through a bath to moisten the web and stripping the moistened web from the solidified molded resin

leaving the ink recordation intact as an integral part of said article.

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