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2,345,852

SHOT SHELL SEALING

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Fig. 1

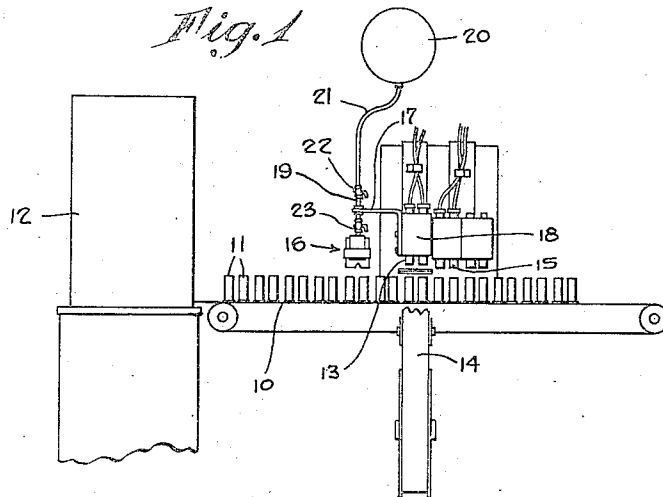


Fig. 2

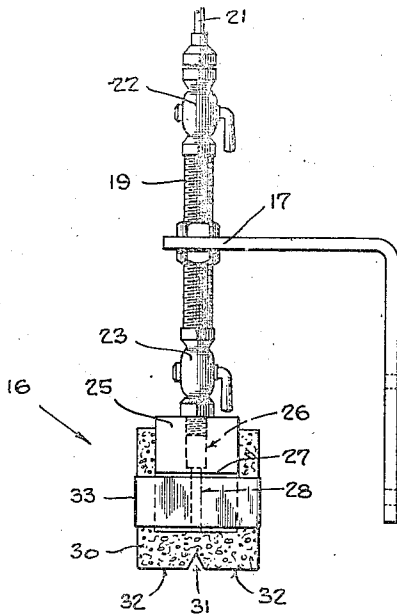


Fig. 3

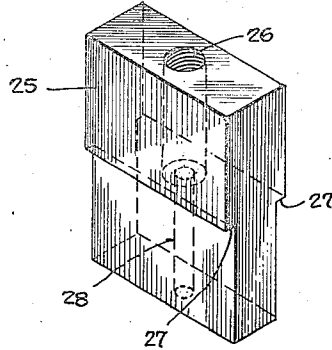
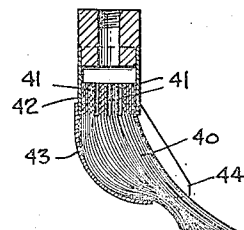


Fig. 4



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SHOT SHELL SEALING

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6 Claims. (Cl. 216—62)

This invention relates to the securing of adhesive or sealing materials to waxed surfaces or wax-impregnated bodies, and will be described with particular reference to the securing of moisture impervious seals to the closures of wax-impregnated paper shot shells.

The patent to Finlay 2,242,907, May 20, 1941, describes a shot shell in which the end closure is formed of the material of the body and is placed substantially flush with the end of the body. It likewise contemplates the sealing of the closure by the use of an adhesive, preferably one of a thermoplastic character, to which a paper disk may be secured. To this end, the closure surface may be abraded to facilitate adhesion. Suitable means for thus abrading the closure surface are shown and described in the co-pending application of Hackman 382,689, filed March 11, 1941. Apparatus for affixing a thermoplastic adhesive, preferably carried on a paper disk, to shot shells as they are delivered from the loading machine, is illustrated in the copending application of Reynolds, Serial No. 291,106, filed August 19, 1939 and issued as Patent No. 2,286,159.

While the method of forming a moisture-proof end-closure for flat top shot shells, disclosed in the above identified applications, has been used extensively in regular production, some difficulty has been encountered in obtaining a uniformly satisfactory seal at the maximum temperature, pressure and time of dwell permissible on the affixing equipment. It has been found desirable, therefore, to improve the seal and at the same time reduce the temperature and time required to effect good adhesion. The present invention comprises the discovery that superior adhesion can be secured and the closing process simplified and cheapened by the use of an appropriate solvent for the adhesive.

It is, therefore, an object of this invention to provide an improved method of securing an adhesive to a wax-impregnated material. A further object is to provide a method and means for securing a thermoplastic coated paper disk to the closure of a shot shell using a solvent for the thermoplastic.

Other objects, features, and advantages will be manifested in the following description.

In the drawing:

Fig. 1 illustrates, diagrammatically, one form of the apparatus which may be utilized in the practice of applying a solvent which assists in the bonding of a thermoplastic adhesive to a wax-impregnated surface, such as a shot shell closure.

Fig. 2 is a front elevation of a device for applying the solvent to the shot shell closure.

Fig. 3 is a perspective view of an element of the solvent applying device of Fig. 2.

Fig. 4 is a cross section of a modification of a solvent applying device of Fig. 2.

The apparatus shown comprises a conveyor belt 10 onto which shot shells 11 are delivered from a loading machine 12 and from which they are removed laterally, preferably in pairs, to positions beneath a pair of disk punches 13 which cut sealing disks from a strip of paper 14 coated with a thermoplastic adhesive, and preliminarily affix these disks to the shot shells. The closure portion of the shot shells may or may not be abraded, it being understood that the method of the present invention is applicable in either circumstance. The pair of shot shells with the disks partially affixed thereon are then transferred to positions beneath a pair of heated plungers 15 where the affixing of the sealing disk is completed. The present invention contemplates the application of a solvent for the thermoplastic sealing material to the closures to be sealed just before the shot shells pass under the paper strip.

The means for applying the solvent to the shot shell closure comprises an applicator or similar coating device, indicated generally at 16. A tubular post 19 is threadably secured by a valve unit 22 into the upper end of the coating device 16 and connected at its upper end to the solvent supply tank 20 by connecting tubing 21 and a valve unit 23. By means of the valves 22 and 23, the flow of solvent from the tank 20 to the device 16 may be maintained substantially constant.

The post 19 is carried at the extremity of an arm of a bracket 17 which is fastened to the reciprocating block 18 of the disk punches 13, whereby the coating device 16 is raised and lowered, with the motion of the block 18, from and into contact with the shot shell closures. Suitable nuts 24 on the threaded portion of the post 19 provide means for raising and lowering the post in the bracket and thus adjusting the applicator to shells of different lengths.

Referring to Fig. 2, the coating device 16 comprises a substantially rectangular block 25 of metal such as brass or any other suitable material drilled and threaded as at 26. The lower half of the block is milled transversely so as to reduce its thickness and form shoulders 27, 27 as indicated in Fig. 3. A hole 28, which may be of somewhat less diameter than hole 26, is drilled in the lower portion of the block and communicates

with the hole 26 so as to conduct the liquid solvent from the connecting tubing 21 through the block 25 into an applicator 30. The latter is shown as a U-shaped block of resilient material such as sponge rubber notched on its bottom surface, as at 31, so as to form two spaced, work-engaging pads 32, 32 and secured on the end of the block 25 by a metal band 33. The latter embraces the block of sponge rubber adjacent the lower thinned portion of the metal block 25 and is bound securely thereto with its upper edge 34 abutting the shoulders 27, 27 of the block 25. It will be clear that the liquid solvent passing down through the orifices 26 and 28 of the block 25 saturates the sponge rubber so that whenever the sponge is lowered into engagement with the shot shell closures of a pair of shot shells, the pads of surfaces 32, 32 wet the flat top closures with the solvent.

Although the coating device 16 is shown substantially rectangular, it will be understood that the block 25 and sponge rubber applicator 30 may be made substantially cylindrical or otherwise modified without exceeding the scope of the invention as defined in the appended claims. In this respect, attention is directed to Fig. 4 which shows an applicator comprising a block 25' provided with the usual rubber-set bristles 40 of any well-constructed paint brush. The block 25' is adapted to be supported by the bracket 17 which, in this instance, may be bolted to a fixed part of the frame so that the brush 40 will be held in a predetermined position with respect to the horizontal plane defined by the flat top closures of the shot shells. The solvent is conducted to the bristles through a plurality of small holes 41 drilled down through the rubber bristle-setting block 42. The rubber binding of the bristles may be replaced by any other binding not adversely affected by the solvent.

In order that the bristles shall spread the solvent uniformly over the tops of the shot shells and to avoid spattering, a metal shoe 43 is secured upon the lower end of the block 42 and provided with an open toe portion 44 through which the bristles project. The toe portion 44 is adapted to bend the bristles in the direction of travel of the shot shells so as to enhance smooth and uniform coverage by the solvent.

Although the above described apparatus is arranged to apply the solvent to the top of the shot shell, it will be apparent that a similarly effective bond may be secured by modifying the applicator supporting means so that the solvent may be applied directly to the adhesive on the underside of the paper strip 14.

The solvent may be selected with reference to the particular adhesive—for example, with an adhesive of plasticized ethyl cellulose, excellent results are secured with iso-propyl alcohol. Other suitable thermoplastic adhesives are methyl cellulose, butyl cellulose, and benzyl cellulose; cellulose acetate and cellulose acetate-butyrate; polyvinyl acetate and its interpolymers; polyvinyl acetals such as polyvinyl acetal, polyvinyl butyral and polyvinyl isobutyral; polyacrylic acid esters such as polymethyl methacrylate, polyisobutyl methacrylate and polyethyl acrylate; certain soluble interpolymides such as may be obtained by polymerizing mixtures of hexamethylene diammonium adipate, hexamethylene diammonium sebacate and 6-aminocaproic acid; polystyrene and interpolymers of polyvinyl chloride. Also blends of these resins or polymers

with plasticizers, softeners and other resinous or polymeric materials may be employed.

In general, solvents of thermoplastic adhesives include acids, alcohols, ketones, esters, ethers, aromatic and chlorinated hydrocarbons, and mixtures thereof. Among such solvents, usable singly or in suitable admixtures, are carbon tetrachloride, trichloroethylene, tetrachloroethylene, toluene, ethyl alcohol, butyl alcohol, isopropyl alcohol, and methyl Cellosolve; the latter is a well known commercial term for a composition of alcohol and ether identified as ethyl glycol monomethyl ether.

By way of illustration only, one example of the practice of the invention using a paper strip coated with plasticized ethyl cellulose is as follows:

A thin film of iso-propyl alcohol is first applied to the closure by one of the above described applicators and thereafter resin coated disks are simultaneously punched from the adhesive strip and pressed on the flat top of the shell. Subsequently the disks are again subjected to pressure, this time by heated plungers which complete the bond between the thermoplastic adhesive and the shot shell closure.

The application of the small amount of solvent to the crimped end of the shell, immediately before affixing the adhesive disk, allows the use of lower temperatures for the pressing plungers, which is very desirable because of the explosive nature of the shells being sealed and the consequent hazard of employing high temperatures near shell loading equipment. In addition, the strength of the bond is increased from fair to excellent and the solvent permits the use of high softening, resinous adhesives which do not exude from the seal during firing so as to deposit on the walls of the firing chamber. Furthermore, the disking punches may be operated substantially cold instead of at an elevated temperature as heretofore practiced, thus insuring smoother feeding of the adhesive tape through the cold guides and longer life of the cutting edges of the disking punches.

What is claimed is:

1. The method of securing a thermoplastic adhesive seal to a wax-impregnated paper body comprising the steps of applying a solvent for the adhesive of said seal to said body, pressing said seal into contact with the solvent coated surface of said body to preliminarily secure the seal thereto and subsequently applying a heated plunger to said seal to permanently affix said seal by heat to said wax-impregnated paper body.

2. The method of sealing the closure of a shot shell with an adhesive composition comprising the steps of abrading the closure forming a portion of the body, applying to the closure a solvent for the adhesive, pressing a disk coated with the adhesive into contact with said solvent and said closure and subsequently applying heat and pressure to said disk to permanently secure it to said closure.

3. In the sealing of the closure of shot shell bodies with an adhesive of plasticized ethyl cellulose, the method which comprises the steps of moistening the closure with iso-propyl alcohol, pressing into contact with said moistened surface a body bearing an adherent coating of plasticized ethyl cellulose to preliminarily secure said body to said closure and subsequently applying heat and pressure to said body to permanently affix said body by heat to said closure.

4. The method of securing a thermoplastic seal

to a wax-impregnated paper body comprising the steps of applying to said body a thermoplastic solvent selected from the group consisting of carbon tetrachloride, trichloroethylene, and tetrachloroethylene, preliminarily securing the thermoplastic seal to said coated surface by said solvent, and then permanently affixing the thermoplastic seal to said coated surface by pressure and heat.

5. The method of securing a thermoplastic seal to a wax-impregnated paper body comprising the steps of applying to the body a thermoplastic solvent selected from the group consisting of ethyl alcohol, butyl alcohol, iso-propyl alcohol,

and methyl Cellosolve, preliminarily securing the thermoplastic seal to said coated surface by said solvent, and then permanently affixing the thermoplastic seal to said coated surface by pressure and heat.

6. The method of securing a thermoplastic seal to a wax-impregnated paper body comprising the steps of moistening the body with toluene, preliminarily securing the thermoplastic seal to the moistened surface by said toluene, and then permanently affixing the thermoplastic seal to said moistened surface by heat.

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