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Dunn

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[54] METHOD AND APPARATUS FOR STRIPPING CONTAINER BODIES FROM A RECIPROCAL MANDREL

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[52] **U.S. Cl.** **72/345**

[51] **Int. Cl.** **B21d 45/00**

[58] **Field of Search** ..... 72/344, 345; 113/120 H

[56] **References Cited**

UNITED STATES PATENTS

3,270,544	9/1966	Maeder et al.	72/346
2,983,366	5/1961	Perret	72/344
3,406,554	10/1968	Frankenberg	72/344
601,738	4/1898	Stampacchia	113/120

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[57] **ABSTRACT**

A method and apparatus are provided for stripping container bodies from a reciprocal mandrel in an ironing press at the completion of the ironing stroke, which includes a resilient pad which is positioned adjacent the exit end of the last ironing ring and aligned with the mandrel for abutment of a container body on the mandrel against the pad at the completion of the ironing stroke, and means for introducing compressed gas into the container body being ironed prior to completion of the ironing stroke. The compressed gas in the container will hold the container body against the resilient pad whereby the mandrel may be withdrawn from the container during its return stroke.

1 Claim, 2 Drawing Figures

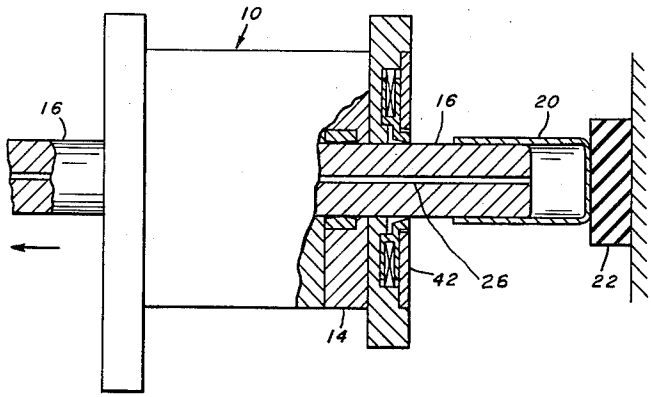


FIG. 1.

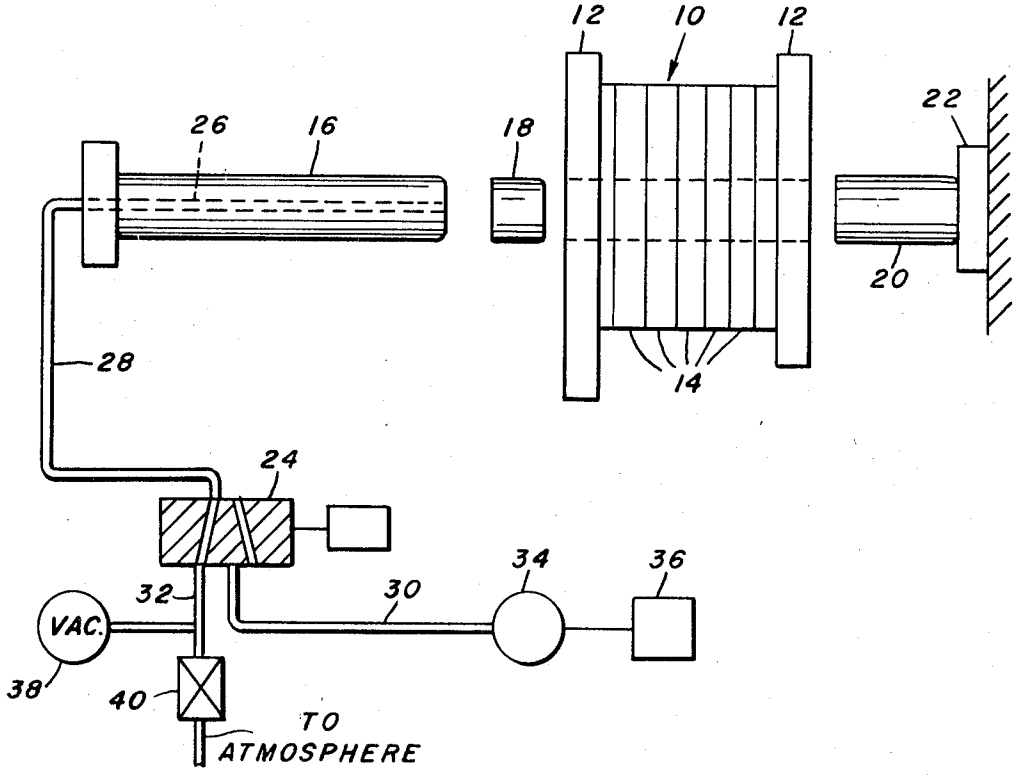
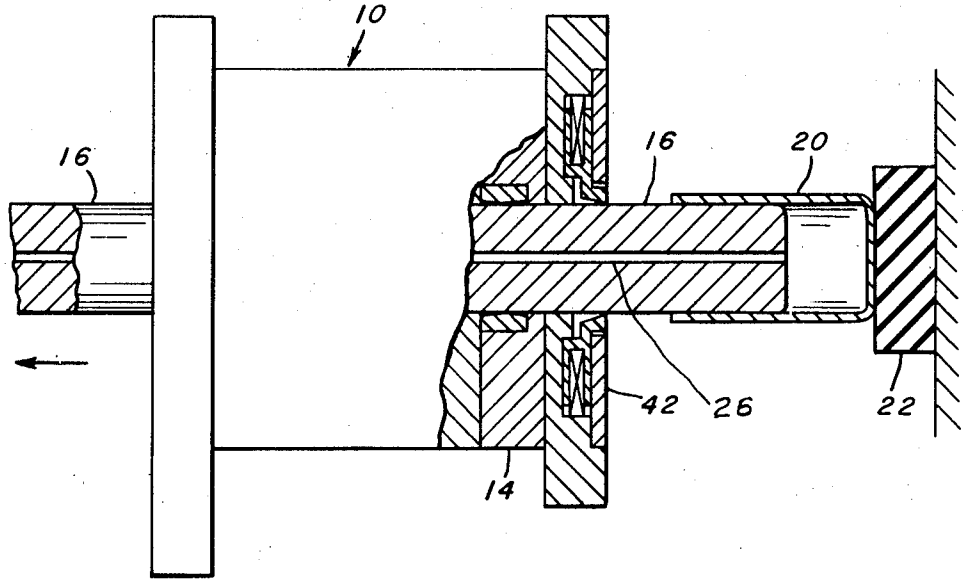


FIG. 2.



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METHOD AND APPARATUS FOR STRIPPING CONTAINER BODIES FROM A RECIPROCAL MANDREL

BACKGROUND OF THE INVENTION

In ironing or thinning the side wall of a container in an ironer or ironing press, it is necessary to provide a means for stripping the container body from the reciprocal mandrel at the completion of the ironing stroke. Heretofore, container bodies have been stripped from ironer mandrels by means of a mechanical stripper located adjacent the last ironing ring as shown in Frankenberg U.S. Pat. No. 3,406,554, by means of a mechanical stripper located in the mandrel as shown in Stolle et al., U.S. Pat. No. 3,423,985, or by means of a combination of a mechanical stripper and air stripper as shown in Maeder U.S. Pat. No. 3,402,591. However, use of such strippers has sometimes resulted in damage to the side wall of the ironed containers during stripping, particularly when the side wall of the continer is very thin. Accordingly, it is desirable to provide stripper means which will assure stripping of a container from the mandrel, but which will not damage the container during stripping.

SUMMARY OF THE INVENTION

This invention provides air stripping means for a container body ironing press which includes a resilient pad located adjacent the exit end of the last ironing ring in the press and aligned with the mandrel for abutment of a container body on the mandrel against the pad at the completion of the ironing stroke, and means for introducing pressure into the container body on the mandrel prior to completion of the ironing stroke. Upon completion of the ironing stroke, the pressure in the container holds it against the resilient pad as the mandrel is withdrawn from the container. The pressure means may include an air pump and a solenoid valve with communication lines to a passageway through the mandrel and into a container body on the end of the mandrel. The solenoid valve is timed to introduce air into the mandrel and container body prior to completion of the ironing stroke, and preferably during movement of the container body through the last ironing ring, so that sufficient air pressure is produced in the container body to hold it against the resilient pad for withdrawal of the mandrel form the container body during the return stroke of the mandrel. The valve may be further timed to shut off the supply of air into the container body prior to complete withdrawal of the mandrel from the body to avoid the formation of objectionable oil mist by the escaping air.

Accordingly, it is an object of the invention to provide improved means for stripping a container body from a mandrel in an ironing press.

Another object of the invention is to provide an improved air stripper for an ironing press to minimize damage to container bodies as they are stripped from the mandrel.

A further object of the invention is to provide a resilient pad adjacent the exit end of the last ironing ring in an ironing press and means for introducing a fluid under pressure into a container body on the mandrel to hold it against the pad so that the mandrel can be withdrawn form the container body.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects and advantages of the invention will be more fully understood and appreciated with reference to the following description and the attached drawings wherein:

FIG. 1 is a schematic drawing of an ironer tool pack assembly and mandrel showing a resilient pad adjacent the exit end of the tool pack, and an air vent and pressure supply system communicating with the mandrel; and

FIG. 2 is an elevational view in partial cross section showing withdrawal of the mandrel from a container which is supported against the resilient pad.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. 1, an ironer tool pack assembly **10** is illustrated which comprises two end caps **12** and a plurality of ironing rings and spacers **14** secured between the end caps, and a mandrel **16** for moving a drawn cup **18** through the tool pack assembly to thin and elongate the side wall of the cup and form a container body **20** as disclosed in my U.S. application Ser. No. 20,268, filed Mar. 17, 1970, entitled Drawn and Ironed Containers, and executed and filed concurrently herewith. Also shown in FIG. 1 is a stop member **22** adjacent the exit end of the tool pack assembly, and an air system for venting the interior of cup **18** as mandrel **16** is introduced into it, and for introducing compressed air into the container body to strip the body from the mandrel as is hereinafter described.

The stop member may take a variety of forms such as a pad **22** of rubber or other viscoelastic material, and preferably is slightly larger in diameter than is the container body and approximately one-half inch or more in thickness. Pad **22** is secured to the ironing press so that the end of the mandrel and a container body on the mandrel will abut against the pad at the completion of the ironing stroke. Inasmuch as mandrel **16** must move a container body completely through the tool pack assembly **10**, the resilient pad **22** will be spaced from the exit end of the tool pack a distance not less than the length of the ironed container body. In practice, it has been found that a spacing of one or two inches in excess of the length of the container body works well. Accordingly, the ironing press will be set up so that the mandrel **16**, upon completion of its ironing stroke, will project beyond the exit end of the tool pack assembly far enough to carry the ironed container body completely through the tool pack assembly and abut against the resilient pad **22**.

The air system for the ironing press includes both an air pressure system and a vent system which can be connected alternatively to air line **28** and passageway **26** in mandrel **16** by means of a solenoid valve **24**. The pressure system is designed to supply air at a pressure sufficient to produce the required stripping force and with sufficient volume flow to maintain that force during stripping. The pressure system comprises a pressure supply line **30** leading into the solenoid valve **24** and a compressor device **36**, and may also include an accumulator tank **34**, if desired, to maintain the volume flow of air for a longer period. The vent system is designed to facilitate introduction of the mandrel into a drawn cup and includes a vent line **32** which leads from the solenoid valve **24**, a vacuum device **38** and a valve **40** which can be opened to ambient pressure conditions. The solenoid valve **24** is actuated by automatic controls which are timed with respect to the operation of the mandrel to vent the interior of cup **18** as mandrel **16** is moved into the cup, and then to introduce pressure into the container body **20** prior to completion of the ironing stroke. The solenoid valve **24** preferably has an "off" position in which the passageway **26** in the mandrel **16** is connected with neither the vent system nor the pressure supply system so that the air can be completely shut off during a portion of the cycle to avoid forming of an oil fog as will be explained.

In operation of the ironing press, a drawn cup **18** is positioned at the entrance end of tool pack assembly **10** by means not shown, and the mandrel **16** is advanced into the drawn cup. During introduction of the mandrel **16** into the cup **18**, solenoid valve **24** connects the air line **28** and the inside of the cup with the vent line **32**. Vent line **32** can either be open to the atmosphere via valve **40** so that air in cup **18** can escape to the atmosphere, or be connected to the vacuum device **38** with valve **40** closed so that the air in the cup can rapidly escape to the vacuum system. The use of a vacuum system is desirable for higher operating speeds to ensure that the air in the cup can quickly escape, or be drawn, from the cup. Continued advancement of mandrel **16** moves cup **18** into and through tool pack **10** to thin and elongate the side wall of the cup to form a thin-walled container body **20**.

To effect stripping of the ironed container body form the mandrel **16**, the solenoid valve **24** is actuated to connected the supply line **28** and the interior of the cup with the pressure line **30** prior to completion of the ironing stroke. This connection will force compressed air into the mandrel **16** and the container body **20** on the end of the mandrel to produce the required stripping force against the end wall of the container. It is important that the stripping force be produced on the container before the mandrel commences its return stroke, but not so early in the cycle that the container would be blown off the mandrel prematurely. Accordingly, the factors which determine the pressure build up in the container such as the pressure and capacity of the supply system, timing of the actuation of the solenoid valve and speed or velocity of the mandrel, are carefully controlled and coordinated to produce the stripping force at the prior time. For example, with a high air pressure and high rate of air flow, less times is required to produce a particular pressure in a container body, and with a high mandrel velocity less time is available for build up of the stripping pressure. Similarly, the pressure required fro stripping also depends on a number of factors such as temperature, lubrication, mandrel finish, and container length and diameter, among others. Accordingly, in order to produce the required stripping pressure at the optimum time these factors are all coordinated in the design of the system.

Once a system has been designed with a particular air capacity, container size, lubricant, etc. changes in the exact timing for producing the required stripping force may be made by adjusting the timing of the actuation of the solenoid valve to change the time at which the compressed air is introduced into the container. If a change in the stripping force is required, this can be effected by changing the pressure in the supply system. However, these adjustments could be made in a variety of other ways which would be obvious to one skilled in the art.

Generally speaking, the solenoid valve is actuated some time after the mandrel has entered the last ironing ring, and before completion of ironing by such last ironing ring. With correctly timed actuation of the solenoid valve, the required air pressure for stripping the container body from the mandrel will have been produced in the container substantially simultaneously with contact or abutment of the end of the container body against the resilient bumper **22**. Upon such abutment of the end of the container against pad **22**, the mandrel **16** commences its return stroke and withdraws from container **20** as is illustrated in FIG. 2. The air pressure in container **20** holds the container against resilient pad **22** during such withdrawal of the mandrel **16**. As for the amount of pressure employed for such stripping, a pressure of approximately **60** pounds per square inch gauge has been employed for one ironing press, but this may vary by 15–20 p.s.i.g., or more.

Another feature of the invention is the timing of the shut off of air into the mandrel so as to avoid the creation of an objectionable oil fog in the ironing press. The solenoid valve **24** is preferably actuated to shut off the supply of compressed air into the mandrel before the mandrel is completely withdrawn from the container body, but the mandrel is not vented until after it has been withdrawn through the tool pack assembly. When the air supply is shut off prior to withdrawal of the mandrel from the container body but not vented, the compressed air which is trapped in the container body has sufficient force to complete stripping of the body form the mandrel, and does effect such stripping. If the air pressure system were left open to the mandrel too long, the escaping compressed air might atomize some of the lubricant in the press and form an undesirable lubricant mist around the press. Such mist is objectionable for reasons of both possible impairment of the health of personnel in the area and the resulting film of lubricant which would settle on the surrounding area. This mist can be a serious problem if the can cleaning and coating area is adjacent to the ironing area.

As mandrel **16** makes its return stroke, it will be completely withdrawn from container **20**, and the container will be free to fall or drop into a bin or conveyor, not shown, positioned below or around the container. Preferably such conveyor or bin will be positioned sufficiently close beneath the container so that it will fall only a short distance into such device and will not be damaged by the fall. Mechanical strippers **42** may also be provided in the tool pack assembly **10** to strip a container body from the mandrel in the event that the air pressure fails to effect such stripping. The mechanical strippers are a safety measure only, however, and it has been found that in an ironing press of the invention, it is usually not necessary to include the mechanical strippers in the press.

It is therefore seen that a unique air stripper is provided for an ironing press which effects removal or stripping of ironed container bodies from the reciprocal mandrel with little or no damage to the container bodies. While a particular embodiment of the invention has been illustrated and described, it will be obvious to one skilled in the art that numerous variations and modifications can be made therein. For example, the stop member against which the end of the container body is run at the completion of the ironing stroke, may be a die which reforms the end wall of the container body. In this form of the invention, the pressure in the container body will hold the body against the die to effect stripping of the body from the mandrel. Running the end of the container against such an end forming die may assist in the stripping operation because reforming of the container will usually result in relative movement between the side wall of the container and the mandrel. This relative movement helps to free the container body from the mandrel to ensure that the force of the stripping pressure will hold the container body against the stop member.

I claim:

1. A method of stripping a cup-shaped container body from a reciprocal mandrel in an ironing press comprising the steps of:

a. introducing air under pressure into the mandrel and into the container body on the mandrel as the container body is moved through the last ironing ring in an ironing press;

b. at the completion of the ironing stroke, pressing the outer end of the container body against a resilient stop member to restrain the container body between the air pressure in the body and the stop member;

c. commencing withdrawal of the mandrel from the container body;

d. shutting off the air supply to the container body prior to completing withdrawal of the mandrel from the container body with compressed air trapped therein; and

e. completing withdrawal of the mandrel from the container body as restrained against the resilient stop member by the trapped compressed air.

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