April 16, 1940. H. F. COX, JR 2,196,982

CAN BODY MAKING MACHINE

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Fig 1

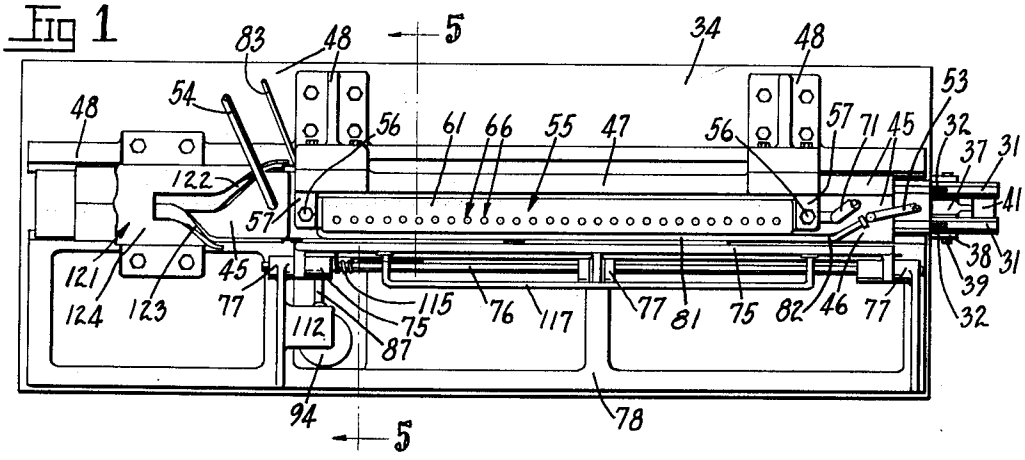


Fig 2

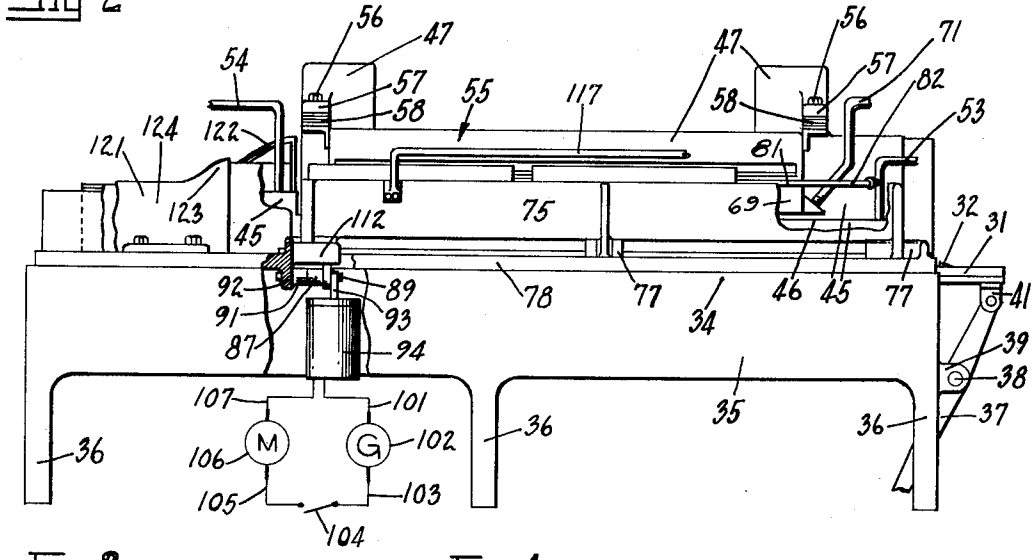


Fig 3

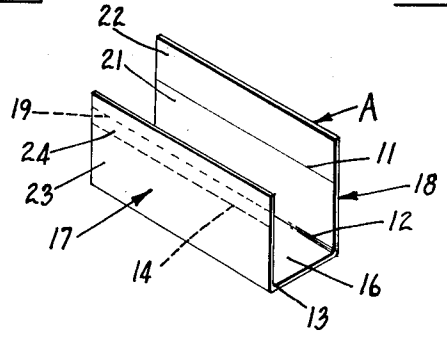
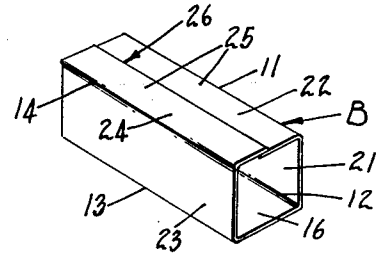


Fig 4



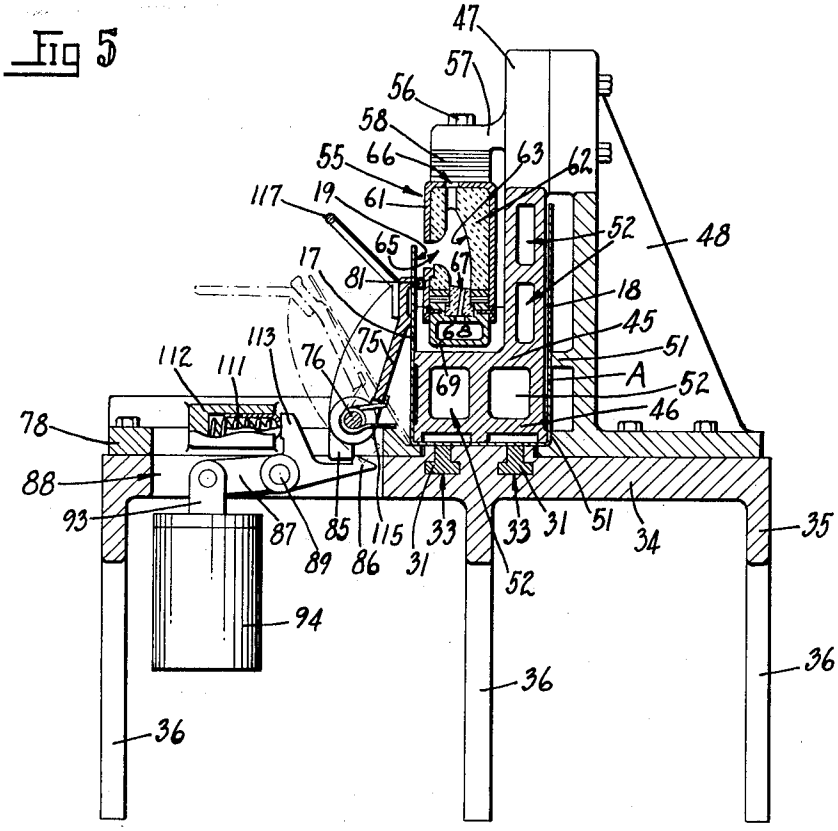
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Fig 5



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CAN BODY MAKING MACHINE

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Application November 25, 1938, Serial No. 242,411

7 Claims. (Cl. 93—49)

The present invention relates to a container or can body making machine for producing fibre cans having seams which are secured by a thermoplastic adhesive and has particular reference to treating the adhesive on the blank from which the body is made to bring it into a tacky condition by applying radiated heat onto only that restricted or confined area of the blank which has the adhesive on it so that the adjoining blank area outside of the adhesive covered portion will not be heated.

An object of the invention is the provision in a fibre can body making machine, of body blank heating devices which throw a restricted beam of radiant heat onto only that portion of the blank where it is desired so that sufficiently concentrated heat may be applied and confined to the thermoplastic adhesive on the blank and kept away from the adjacent uncovered areas thereby preventing scorching or other detrimental effect upon the blank.

Another object is the provision of such heating means wherein quicker heating action and a more intense heat are obtained in a controlled space thereby resulting in more rapid production and a saving in fuel since a lesser amount need be used when the resulting heat is so intense.

A further object is the provision of a concentrated heat means of the character described which concentrates the heat on a passing blank so that the blank may be coated with thermoplastic cement in other places where the cement is not to be rendered tacky until a subsequent time thereby preventing fouling machine parts by sticky adhesive.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a top plan view of a can body making machine embodying the instant invention, with parts broken away;

Fig. 2 is a side elevation of the machine shown in Fig. 1, with parts broken away, the view also illustrating a wiring diagram of electric apparatus used in connection with the machine;

Fig. 3 is an enlarged view of a partially formed can body adapted to be operated on in the machine shown in Figs. 1 and 2;

Fig. 4 is a view similar to Fig. 3 showing the completed can body; and

Fig. 5 is an enlarged transverse section of the machine taken substantially along the broken line 5—5 in Fig. 1.

As a preferred embodiment of the invention the drawings illustrate the principal parts of a fibre can body making machine in which partially formed can bodies A (Fig. 3) are adapted to be operated upon and transformed into finished or completed can bodies B (Fig. 4). By way of example the completed can body illustrated is similar to the type used in the milk container disclosed in United States Patent 2,085,979, issued July 6, 1937, to John M. Hothersall, on Container.

In making the body of such a container a flat rectangular blank is preferably used having spaced and parallel transverse crease lines 11, 12, 13 and 14 which set off what will be the side walls of the finished body. When the blank enters the instant machine it has by preference already been folded into a U-shape along the lines 12, 13 thereby producing one side wall 16 having adjacent its bent edges an upwardly extending short leg 17 and a long leg 18. Leg 17 at its upper marginal edge carries a band of dried thermoplastic adhesive 19 which is on the inside surface of the leg.

While in the machine the adhesive 19 is melted by heat into a tacky condition and immediately thereafter leg 18 is bent at right angles along its crease line 11 thus setting off a body side wall 21 and a partial side wall 22. The leg 17 is then folded at right angles along its crease line 14, the upper portion of the leg being bent down in overlapping relation to the partial side wall 22. This bending action provides a third side wall 23 and a partial side wall 24, the partial side walls 22, 24 being united or bonded together by the tacky adhesive into a fourth side wall 25 having a side seam 26.

The partially formed U-shaped body A is fed into the machine in any suitable manner and is advanced along a straight line path of travel by a pair of spaced and parallel feed bars 31 (Figs. 1, 2 and 5) having spring held dogs 32. The feed bars are disposed in slide grooves 33 formed in the top of a table 34 of a frame 35 supported on legs 36.

The feed bars 31 are reciprocated in time with the other moving parts of the machine by a lever 37 which may be actuated by any suitable source of power. Lever 37 is mounted intermediate its length on a pivot pin 38 carried in bearing lugs 39 formed on the frame 35. The upper end of the lever is connected to a pivot block 41 which is secured to the outer ends of both of the feed

bars. Hence the feed bars are reciprocated in unison in their slide grooves 33.

As the partially formed can body A is advanced along its straight line path of travel it is maintained in its U-shape by sliding along a horn or mandrel 45 (Figs. 1, 2 and 5) which is disposed directly over the slide bars 31. The horn is preferably L-shaped having a bottom leg section 46 and an upright leg section 47. This horn is supported on brackets 48 which are bolted onto the table 34, the upper end of the upright leg section 47 of the horn being bolted to the upper end of the brackets so that the horn will be suspended over the table in spaced relation therewith. However, the space between the table and the bottom of the horn is only substantially the thickness of the material of the can body to permit passage of the body along the horn.

The long leg 18 of the can body extends up adjacent the upright leg 47 of the horn, the body leg being maintained in this position by guide rails 51 formed on the bracket 48. In a similar manner the short leg 17 of the can body extends up adjacent the outer side of the bottom leg section 46 of the horn, the upper end of the body leg extending above the top of the horn where the adhesive 19 carried on the inside surface thereof is in an exposed position as best shown in Fig. 5.

The horn 45 is preferably maintained at a cool temperature by a cooling medium such as cold water, brine or the like, which is circulated therethrough. For this purpose the interior of the horn is formed with a plurality of longitudinal channels 52 which at their ends communicate with each other in a manner to form one long continuous channel which winds back and forth through the horn. The cooling medium is circulated through this channel by way of an inlet pipe 53 and an outlet pipe 54.

Inlet pipe 53 connects with any suitable source of supply of the cooling medium while the outlet pipe 54 leads to any suitable place of deposit. This outlet pipe may be a return pipe if desired so that the cooling medium may be returned to its source of supply for reuse. It is while the body is passing along this horn that the exposed dried adhesive 19 on the short leg 17 is reduced to a tacky condition by heating.

Heating of the thermoplastic adhesive 19 on the body leg 17 is effected by a radiant heating device 55 which extends longitudinally of horn 45. This heating device is disposed in the L recess of the horn over the bottom leg 46 with its back alongside the upright leg 47. The front of the heating device is adjacent the exposed upper portion of the short leg 17 of the body, the entire device being suspended at its ends in spaced relation to the horn, by bolts 56 which are carried in lugs 57 formed on the upright leg 47 of the horn. Spacing shims 58 are interposed between the lugs and the device so that the latter may be vertically located at a desired height.

The heating device 55 includes a rectangular metal casing 61 which carries a hollow lining core 62 of ceramic material preferably having an inner parabolic reflecting or radiating surface 63. The front wall of the casing 61 and the ceramic core 62 are cut away to provide a restricted heat radiating slot or opening 65. This opening extends the full length of the heating device and is substantially the same width as the band of adhesive 19 on the body leg 17 and further is located directly opposite the path of travel of this band of adhesive as the body advances along the horn. It is for the purpose of accurately locating this slot relative to the adhesive band that the shims 58 are provided.

The top of the casing 61 and the ceramic core 62 are cut through in a row of spaced vent holes 66. The bottom of the core is also provided with a row of spaced holes or ports 67 which lead into a gas fuel chamber 68 formed in a conduit or manifold 69 secured to the bottom of the casing 61. One end of this chamber is connected to a pipe 71 which is threaded into the conduit and which leads from a suitable source of supply of gas and air mixed in proper proportions for complete combustion.

Thus the gas admitted into the chamber 68 flows out into the hollow ceramic core by way of the holes 67 and when ignited provides a row of flaming jets of fire which heat the ceramic core to substantially incandescent white heat. This heat is radiated outwardly by the parabolic wall section 63 through the slot 65 and impinges against the adhesive 19 on the body A rendering it tacky. Since the width of the slot is substantially the same as the width of adhesive band, it is only the adhesive which is heated and the non-adhesive body area on one or both sides of the adhesive is not heated, thereby preventing scorching of these uncovered areas.

The short leg 17 of the partially formed body A is normally held in heat receiving position adjacent the radiant heating device 55 by a guide rail 75 which is mounted on a pivot shaft 76 carried in bearings 77 formed in a plate 78 secured to the top of the table 34. The guide rail presses the leg 17 against a locating tube or pipe element 81 which is fixed to the casing 61 adjacent the heating slot 65. This tube positions the leg 17 relative to the heating device so that it will always be spaced a predetermined distance away.

The locating tube 81 is preferably cooled so that it will not scorch the portion of the body coming into contact therewith. The cooling medium which is used may be cold water, brine or the like which is circulated through the tube by way of an inlet pipe 82 and an outlet pipe 83. These pipes if desired may be connected into the inlet pipe 53 and outlet pipe 54 of the horn cooling system, thus using the same cooling medium in the whole system.

Provision is made for releasing the leg 17 of the partially formed body A from its position adjacent the heating device when for any reason the machine stops operating. This prevents bodies already in the machine from coming to a stop in front of the heating device and hence prevents them being unduly scorched or even taking fire due to the intense heat. For this purpose the guide rail 75 is formed with a depending lug 85 (Fig. 5) which is normally engaged by a hook 86 formed on the inner end of a solenoid lever 87. The lever is located in an opening 88 formed in the table 34 and is mounted on a pivot pin 89 carried in a bearing 91 formed on a depending lug 92 of the plate 78. The outer end of the lever is connected to a movable core 93 of a solenoid 94.

One terminal of the solenoid is connected by a wire 101 (Fig. 2) to a source of electric energy such as an electric generator 102. The generator is also connected by a wire 103 to a service switch 104 which in turn is connected by a wire 105 to an electric motor 106 which may be the source of power for driving the machine. This motor is connected by a wire 107 to the opposite terminal of the solenoid.

Thus when the service switch 104 is closed, electric energy from the generator 102 drives the motor and also energizes the solenoid 94. The energized solenoid draws in its core 93 and thus the hook end 86 of lever 87 is maintained in engagement with the lug 85 of the guide rail 75. The latter is thus retained in body guiding position. However, when the machine stops operating, due to a failure in current or by opening of the service switch 104, the circuit is broken and the solenoid becomes de-energized.

When the solenoid is de-energized a spring barrel 111 located in a lug 112 formed on the plate 78 acts on an arm 113 formed on the solenoid lever and this rocks the lever depressing its hook end 86. The lug 85 is therefore released and the guide rail 75, under the pressure of a torsion spring 115 wrapped around the pivot shaft 76, is rocked back out of the way into the dotted position shown in Fig. 5. The natural spring in the can body material immediately moves the body leg 17 outwardly following the guide rail in its movement. In this retracted position the body wall is no longer subjected to the heat issuing from the slot 65 of the heating device.

When it is desired to again bring the guide rail 75 into operating position it must be raised manually. For this purpose there is provided a handle 117 which is secured to the guide rail. However, the guide rail will not remain in operating position if the solenoid 94 is not energized. Thus bringing of a body leg 17 into heat receiving position before the machine is in actual operation is prevented.

After rendering the adhesive on the body leg 17 tacky the partially formed body A passes beyond the region of the radiant heating device 55 and into a body folding element 121 (Figs. 1 and 2). In this element the extended upper leg of the horn 45 is absent and the cross section of the horn is then confined to the rectangular shape of its bottom leg 46 which is substantially the size and shape of the finished body. The folding element includes a pair of stationary folding guides 122, 123 which are formed on a tubular member 124 surrounding the reduced horn and which is bolted to the plate 78 on top of the table.

The entrance end of the guide 122 is in advance of the entrance to the guide 123 so that as the partially formed body A moves along the horn the first part to be engaged is its upstanding leg 18 which strikes against the guide 122 and moving under the guide is thus folded down onto the top of the horn along its crease line 11. This is not done all at once but is a gradual folding over of the body wall. It is this folding action which sets off the side wall 21 and the partial side wall 22.

During this folding action on the can body but in point of time beginning later, the opposite upstanding body leg 17 carrying the tacky adhesive engages the guide 123 and is gradually folded down on top of the already folded partial wall section 22, the leg being folded along its crease line 14. Thus the side wall 23 is defined as is also the adjoining partial side wall 24 which is now flat against the wall section 22 and with the heated and tacky adhesive interposed between them.

As the body thus folded moves further inside of and through the tubular member 124, the overlapped side wall sections 22, 24 are tightly squeezed together producing the fourth side wall 25 of the body. The connected parts are thus bonded together by the adhesive in the connecting side seam 26. What was the partially formed body A when it entered the machine is now transformed into the finished body B which may be discharged from the horn to any suitable place of deposit.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a fibre can body forming machine, the combination of feeding devices for propelling partially formed can bodies along a predetermined path of travel, a said body having a band of thermoplastic adhesive thereon, and an adhesive heating device located adjacent the path of travel of said can bodies for rendering said adhesive tacky, said heating device radiating a restricted beam of heat confined to a definite area of a passing can body so that the body adjacent the edges of the adhesive is not heated.

2. In a fibre can body forming machine, the combination of a horn for guiding partially formed can bodies having a band of thermoplastic adhesive thereon along a predetermined path of travel, and an adhesive heating device located adjacent the path of travel of said can bodies for rendering said adhesive tacky, said heating device radiating a restricted beam of heat which is confined in outline to impinge against a passing can body only on the band of adhesive without heating the body adjacent the edges of the adhesive.

3. In a fibre can body forming machine, the combination of a horn for guiding partially formed can bodies along a predetermined path of travel, said can bodies having an upstanding leg carrying a band of thermoplastic adhesive, an adhesive heating device located adjacent the path of travel of said can bodies for bringing said adhesive into a tacky condition, said heating device radiating a restricted beam of heat confined in its radiating outline to strike onto the band of adhesive on said passing body without heating the body beyond the edges of the adhesive, a guide rail for retaining said body leg in a heat receiving position relative to said heating device as it passes therealong, and means for swinging said guide rail out of body retaining position when the machine stops operating to permit said body leg to spring away from the heating device and prevent scorching of the body.

4. In a fibre can body forming machine, the combination of a horn for guiding partially formed can bodies along a predetermined path of travel, said can bodies having an upstanding leg carrying a band of thermoplastic adhesive, an adhesive heating device located adjacent the path of travel of said can bodies for transforming said adhesive into a tacky condition, said heating device radiating a restricted beam of heat which is projected onto the band of adhesive without heating parts of the body leg not covered by the adhesive, a blank locating element adjacent said heating device for locating said body leg a predetermined distance away from said heating device but in heat receiving position, said locating element being maintained at a cool temperature

by a cooling medium circulated therethrough to prevent scorching of said blank leg, and a guide rail adjacent said locating element for retaining said body leg in engagement therewith.

5. In a fibre can body forming machine, the combination of a horn for guiding partially formed can bodies along a predetermined path of travel, a said body having a band of thermoplastic adhesive thereon, an adhesive heating device located adjacent the path of travel of said can bodies for rendering said adhesive tacky, said heating device radiating a restricted beam of heat of definite outline onto the band of adhesive on said passing body without heating the body adjacent the edges of the adhesive, and forming means for bringing the side seam edges of a partially formed body together in overlapping relation and for bonding these edges together in a side seam with the tacky adhesive therebetween.

6. A radiant heating mechanism for imparting a tacky condition to a band of thermoplastic adhesive carried on a fibre can body blank, comprising a metal casing having a slot therein, a ceramic hollow core in said casing, and means for heating said core to incandescence, said core having a curved reflecting surface in alignment with the slot in said casing for radiating therethrough a restricted beam of intense heat which may be directed against a predetermined portion of said can body blank, said heating means including a gas fuel chamber enclosed by a conduit disposed beneath said casing and a plurality of spaced ports communicably connecting said fuel chamber with said hollow core for conducting gaseous heat into spaced portions of the latter.

7. A radiant heating mechanism for making tacky a band of thermoplastic adhesive carried on a fibre can body blank, comprising a casing having a slot therein, a hollow ceramic member in said casing having a reflecting surface in alignment with the slot in said casing, and means for heating said ceramic member to incandescence for radiating a restricted beam of intense heat through the slot in said casing which may be directed against a predetermined portion of said can body blank, said heating means including a gas fuel chamber enclosed by a conduit disposed beneath said casing and a plurality of spaced ports communicably connecting said fuel chamber with said hollow ceramic member for conducting gaseous fuel into spaced portions of the latter.

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