The present invention relates to a bacon forming system and apparatus, and more particularly to an improved system and apparatus for forming bacon to minimize the problem of wrinkles in pressed bacon slabs.

Bacon slabs are generally formed in a bacon press into substantially rectangular shape so that bacon slices of approximately uniform length and width can be obtained from the bacon slab. During the pressing operation the width of the bacon may be reduced from about 12" to about 9". However, due to the fact that an unpressed bacon slab has a depression or cavity in its inside surface at the ham end, called a flank pocket, wrinkling will occur in the fat side of bacon slabs at the flank pocket during the pressing operation due to bunching-up of the thinner section material at the flank pocket. This wrinkled condition of a portion of the bacon slab results in a yield of misshapen and ragged slices of bacon from the wrinkled portion of the slab which have to be downgraded to a lower quality level, resulting in a lower selling price for that portion of the sliced bacon.

It has been proposed that a bacon forming press be provided with a shaped solid metal filler plate which has a smooth rounded surface and which is shaped and sized to approximately fill an average flank pocket during the pressing operation. However, in commercial meat processing operations substantial wrinkling may still occur in the pressed slabs in spite of the use of the solid metal filler plate. Specifically, experience has shown that the incompressible solid metal plate causes a large wrinkle or wrinkles to be permanently pressed into the rather easily deformable bacon slab by the pressure applied to it during the pressing operation. Moreover, as a metal filler plate necessarily has a specific size and shape, and as the bacon slabs being processed obviously have irregular shapes and surfaces including flank pockets of different sizes and shapes, it is not always possible to even approximately obtain a desired size relationship between the plate and the flank pocket, resulting in objectionable variations in the pressed bacon slab product. Although the prior art proposes that there be different locations of the filler plate to accommodate bacon slabs of different sizes, nevertheless, this has not worked out in practice because of the obviously substantial amount of time required to separate unpressed bacon slabs into lots having flank pockets of like size, and then to relocate the filler plate each time a different lot is processed. Moreover, the prior art solid metal filler plate has been employed to enter the flank pocket from the lean side of the bacon. In practice this has been found to be unsatisfactory because of objectionable depression or cavity will then be pressed into the lean edge of the bacon which is the only portion of the sliced bacon visible through the window provided in the usual bacon package.

It is therefore a primary object of the present invention to provide an improved structure for eliminating the wrinkling that occurs in pressing bacon slabs.

Another object of the invention is to provide an improved bacon forming system and apparatus for yieldingly supporting a certain portion of the bacon slab during the pressing operation to eliminate wrinkles in the pressed slab.

A further object is to provide improved bacon press-
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3. A sectional view of a resilient shaped filler pad of FIG. 7 taken along the line 9-9.

Referring now to the drawing, and particularly to FIG. 1, there is shown a bacon forming press 10 of the type having a bacon forming chamber 11 therein provided by relatively movably pressing plates including a bottom plate 12, a top plate 13, end plates 14 and 15, and side plates 16 and 17. All of these pressing plates have flat, rigid and smooth surfaces and are aligned so as to produce a rectangular shape bacon slab. The length and thickness of the finished bacon slab will vary depending on the dimensions of the original bacon belly and the pressure used during the pressing operation, and the width of the slab will depend on the setting of the suitable width gauge 9 set by the operator. The press 10 is hydraulically operated, and top plate 13, end plate 15, and side plate 17 are hydraulically operated movable plates which operate in sequence by means of suitable conventional control valves, the details of which are omitted for brevity. Side or front plate 17 is of the disappearing type, arranged to drop down out of sight at the conclusion of the pressing operation to facilitate loading and unloading of the forming chamber 11. The press 10 includes means for moving the movable press plates to carry out a bacon forming operation, including a conventional hydraulic fluid pump (not shown) driven by a conventional electric motor (not shown), energized from a suitable power source such as a 110 volt supply line, actuated by a push button start-stop switch 18.

The invention to which this application is directed is shown in FIGS. 2, 3, 4, 5, and 6. It includes means providing yielding support for the caviled flank pocket portion of the bacon comprising a rectangular diaphragm 30 of a flexible resilient material, which may advantageously be of a suitable grade of polyurethane or neoprene bushing mounted in plate 12 over the outlet of a high pressure air line 31. Diaphragm 30 may simply be mounted in a cavity formed in the top of plate 12 or the mounting for diaphragm 30 may include an open-topped rectangular box 29 recessed in plate 12, and formed by a base member 29a and side members 29b. The base member 29a has a hole 29c through it, adapted to accommodate a fitting 31a connecting to line 31. Diaphragm 30 may preferably include an embedded rectangular metal plate 38 (see FIGS. 3-6) for maintaining its shape. Plate 38 has a fitting 38a (FIGS. 5 and 6) mounted in a central opening in plate 38, adapted for connection to fitting 31a. The diaphragm 30 is extended only to the bottom surface and the sides of plate 38, thus forming a shallow enclosed space 30b (FIG. 6) communicating with line 31 via fittings 38a and 31a, which enlarges on inflation of diaphragm 30 (FIG. 4). The air line 31 may be supplied from a conventional supply of compressed air 33, connected in turn to a line 35 which may advantageously include a conventional filter 34, and a regulator 35 providing an adjustable screw and handle 36 for adjusting the pressure used to inflate the diaphragm 30. The flow of high pressure air to the diaphragm 30 is controlled by means including a solenoid operated valve 37. The solenoid associated with valve 37 is energized from a suitable power supply which may advantageously be that provided for the motor and other circuitry of the press 10.

Prior to pressing, the bacon slabs to be pressed are cooled by conventional means to a predetermined temperature suitable for bacon forming operations. A temperature of about 25°F in the bacon slab has been found to yield good forming results, as the bacon slab is somewhat plastic and deformable at this temperature and when subjected to the pressing operation will take a set which does not materially change after the pressing operation.

The press 10 is prepared for pressing operations by actuating start-stop switch 18. An unpressed bacon slab (see FIG. 3), having irregular surface and varying contours including a flank pocket or cavity 41 in the lean top 42 of the bacon slab 40 at its ham end, is then placed in the chamber 11 of press 10. A fat bottom of the bacon slab 40 is indicated at 42. The sequence of the pressing operations of the press 10 is initiated by the dual control levers 20 and 21, which for safety reasons, are arranged so that both hands of the operator must be pressing downward on the levers 20 and 21 in order to operate a bar 20a (FIG. 1) which must be depressed to start and carry out the cycle. After the levers 20 and 21 are pressed downward to operate bar 20a, bar 20a actuates a hydraulic valve 19 (FIG. 1) to start the press cycle. A limit switch 50 (FIGS. 1 and 6) is also actuated to close condition by the position of the levers 20 and 21, thus setting up a circuit to energize the solenoid of valve 37 (FIG. 6). The disappearance bar 17 (FIG. 1) then rises through the operation of the control valves controlling the cycle of press 10 to define the bacon forming chamber 11. Next top plate 13 moves downward relative to bottom plate 12. When the plate 13 is lowered to a predetermined relative spacing between plates 12 and 13 assuring application of some pressure on the bacon slab 40, the press cross-member carrying plate 13 actuates a limit switch 51 (FIGS. 1 and 6), which may advantageously be mounted on a slotted bracket fastened to the top of the operation, forming chamber 11. This actuates the solenoid operated valve 37. It should be noted that limit switch 51 thus constitutes means for actuating expansion of diaphragm 30, responsive to sensing of a desired spacing between plates 12 and 13 and thereby provides means preventing inflation of diaphragm 30 until there is pressure on the bacon slab from top plate 12. This prevents diaphragm 30 from being accidentally blown out of its mounting when the compressed air valve 37 is opened. It should also be noted that the limit switches 50 and 51 may advantageously be adjustable mounted so that they may be precisely located for actuation at desired portions of the press cycle.

Energization of the solenoid causes valve 37 to open, releasing high pressure air through line 31 to inflate the diaphragm 30, therefore, expands concurrently with application of pressure to the bacon slab, forcing the bacon slab at the flank pocket zone or portion 41' against the press top plate 13 (see FIG. 4). Side plate 16 is then actuated to press inward against the bacon slab. When plate 16 has advanced to a predetermined point set by width gauge 9, cam means, not shown, control the operation of press 10 to actuate an end cylinder 15a to press inward against the bacon. During all of these pressing movements of the flap and rigid press plates 12, 13, 14, 15, 16 and 17, the yielding diaphragm 30 is exerting a yielding pressure against the flank pocket portion 41' of the bacon slab opposite the flank pocket in the lean side of the bacon slab (see FIG. 4). When the pressing cycle is completed, the levers 20 and 21 are released, permitting the cylinders of press 10 to retract, and at the same time limit switch 50 opens (FIGS. 1 and 6) breaking the circuit energizing the solenoid of valve 37. This allows the diaphragm 30 to deflate before upper plate 13 leaves the bacon.

The press 10 is adjusted by turning a valve adjustment handle 71 forming part of a relief valve 70 (FIG. 1) so that during pressing operations the flat and firm pressing plates 12-17 apply pressure against the top, bottom, sides and ends of the bacon slab 40 such as to develop a pressure of approximately 80 pounds per square inch in the bacon as indicated by a gauge 55 (FIG. 1). In the improved method of forming herein it has been found that the air pressure exerted against the diaphragm 30 may advantageously be adjusted by regulator screw 35 to approximately 50 pounds per square inch as indicated by gauge 56. As the cooled unpressed bacon slab is somewhat plastic and deformable at its approximately 25°F temperature during the pressing operation, the difference in pres-
sure developed in the bacon by the flat plates 12, 13, 14, 15, 16, and 17, over that exerted by the diaphragm 30 results in a preferential formation of the bacon slab in directions away from the high pressures applied by the flat plates toward the cavity at the flank pocket. Therefore, during the forming operation the bacon slab through the operation of the present invention is reshaped so that material from thicker portions of the unpressed bacon slab shifts somewhat in the direction of the thinner flank pocket portions, resulting in a substantially uniform cross-section in the finished bacon slab.

Tests based on actual commercial lots in a large bacon press of the plant employed the preferred embodiment of the invention indicate that the process substantially eliminates the wrinkling problem in pressing bacon slabs and achieves a marked improvement in the yield of higher quality bacon from a bacon slab.

Referring now to FIGS. 7 and 8, there is shown therein a cross-section of the invention in which a press plate wall member consisting of a resilient shaped pad 60 of a suitable rubber or rubber-like material is employed in place of the expandable diaphragm 30. The pad 60 is shaped and sized appropriately in accord with the flank pocket of a typical unpressed bacon slab as indicated in FIGS. 7 and 8, and may be suitably bonded to a mounting plate 61. The mounting plate 61 may be a press bottom forming plate 65 by any suitable means, for example, a plurality of mounting screws 62. In utilizing the embodiment shown in FIGS. 7 and 8 an unpressed bacon slab is placed on the bottom forming plate 65 of a conventional bacon forming press with the flat side of the bacon belly against the pad 60. The flank pocket portion of the bacon belly is disposed directly over the pad 60. During pressing operations the pad 60 provides a resilient yielding pressing member which operates on the bacon slab in conjunction with the flat plates of the press thus providing yielding support of the bacon slab at the flank pocket portion during pressing, and which thereby permits the bacon slab to be reshaped to the desired wrinkling-free rectangular shape during the formation operation.

Compressed air is used for the fluid to inflate or expand the diaphragm 30 in the illustrated embodiment of FIGS. 1-6. However, it will be recognized that other fluids might also be suitable, for example, another gas, or a suitable hydraulic fluid.

While it is more convenient to mount the resilient wall member 30 (or 60) in the bottom plate of the press, with suitable modifications it could also be mounted in the top plate of a press, in which case the bacon slab would be inserted end foremost but yielding the flat side up and the flank pocket portion open downwardly.

While there has been described what is at present considered to be the preferred embodiments of the invention, it will be understood that other modifications may be made therein and are intended to be included within the scope of the appended claims wherein there is claimed:

1. Method of forming bacon slabs having flank pockets into substantially wrinkling-free rectangular slabs, comprising the steps of placing an unpressed slab on a flat press surface, restraining movement of said unpressed slab at one side and on one end, and pressing the slab from the top and from the unrestrained side and end thereof but concurrently yielding supporting the flank pocket portion of the bacon slab.

2. Method of pressing a bacon slab having a flank pocket into a substantially rectangular shape in a bacon press, comprising the steps of: cooling a bacon slab to a desired forming temperature of about 25° F., placing the bacon slab in a forming press cavity, limiting expansion of said slab at its sides and on one end, and pressing the slab from the top, one side and from the unrestrained side thereof but yieldingly supporting the flank pocket portion of the bacon slab, whereby the bacon slab may be formed into a substantially rectangular shape with a minimum formation of wrinkles at the flank pocket portion.

3. Method of pressing a bacon slab having a flank pocket portion, comprising steps of: applying pressure against the top, bottom, sides and ends of a bacon slab to press the bacon slab into a substantially rectangular shape but yieldingly supporting the bacon slab at its flank pocket portion, so that the pressed bacon slab is substantially wrinkling-free at its flank pocket portion.

4. Method of pressing a bacon slab having a flank pocket portion into a substantially wrinkling-free rectangular shape, comprising the steps of: applying pressure against the top, bottom, sides and ends of a bacon slab to press the bacon slab into a substantially rectangular shape but yieldingly supporting the bacon slab at its flank pocket portion with a lesser pressure so that there will be preferential forming of the bacon slab in directions leading toward the flank pocket portion with consequent filling of the flank pocket portion without substantially wrinkling the flank pocket portion.

5. Method of pressing a bacon slab having a lean top and a fat bottom into a substantially wrinkling-free rectangular shape, comprising the steps of: applying pressure against the top, bottom, sides and ends of a bacon slab to press the bacon slab into a substantially rectangular shape but yieldingly supporting the bacon slab at its flank pocket portion, and means disposed at the surface of one of said slabs for exerting pressure against the bacon slab at its flank pocket portion, so that the bacon slab is pressed by said slabs and said side and end plates, said means yields to enable said slab to be formed into a substantially wrinkling-free rectangular shape.

6. In a press for pressing bacon slabs having flank pocket portions: a pair of relatively movable, flat, rigid platens for contacting and exerting pressure against the top and bottom of a bacon slab, a pair of flat, rigid, side plates and a pair of flat, rigid end plates for exerting pressure respectively against the sides and ends of the bacon slab, and means providing yielding support for the bacon slab at its flank pocket portion, said means including an expandable diaphragm mounted by one of said slabs, so that said bacon slab can be yieldably supported at its flank pocket portion while said slabs and said side and end plates exert pressure against said bacon slab.

7. In a press for pressing bacon slabs having flank pocket portions: a pair of relatively movable, flat, rigid platens for contacting and exerting pressure against the top and bottom of a bacon slab, a pair of flat, rigid side plates and a pair of flat, rigid end plates for exerting pressure respectively against the sides and ends of the bacon slab, and means providing yielding support for the bacon slab at its flank pocket portion, said means including an expandable diaphragm mounted by one of said slabs, means to deliver a fluid under pressure against the underside of said diaphragm for expanding said diaphragm, and means operable when said slabs are moved to a predetermined spacing from each other for operating said expanding means.

8. In a press for pressing bacon slabs having flank pocket portions: a pair of relatively movable, flat, rigid platens for contacting and exerting pressure against the top and bottom of a bacon slab, a pair of flat, rigid side plates and a pair of flat, rigid end plates for exerting pressure respectively against the sides and ends of the bacon slab, means providing yielding support for the bacon slab at its flank pocket portion, said means including an expandable diaphragm mounted by one of said slabs, means to deliver a fluid under pressure against the underside of said diaphragm for expanding said diaphragm, and means operable when said slabs are moved to a predetermined spacing from each other for operating said expanding means.

9. In a press for pressing bacon slabs having flank pocket portions: a pair of relatively movable, flat, rigid platens for contacting and exerting pressure against the top and bottom of a bacon slab, a pair of flat, rigid side plates and a pair of flat, rigid end plates for exerting pressure respectively against the sides and ends of the bacon slab, means providing yielding support for the bacon slab at its flank pocket portion, said means including an expandable diaphragm mounted by one of said slabs, means to deliver a fluid under pressure against the underside of said diaphragm for expanding said diaphragm, and means operable when said slabs are moved to a predetermined spacing from each other for operating said expanding means.
slab, an expandable diaphragm mounted by one of said platens for engagement with a bacon slab at its flank pocket portion, means to deliver a fluid under pressure to the underside of the diaphragm for expanding said diaphragm, and means for regulating the fluid pressure acting against said diaphragm so that as pressure is applied to the bacon slab by said platens and said side and end plates, the flank pocket portion is yieldably supported by said diaphragm which yields as the pressure in the bacon slab increases.

10. In a press for pressing bacon slabs having flank pocket portions: a pair of relatively movable, flat, rigid platens for contacting and exerting pressure against the top and bottom of a bacon slab, a pair of flat, rigid side plates and a pair of flat, rigid end plates for exerting pressure respectively against the sides and ends of the bacon slab, an expandable diaphragm flush mounted in one of said platens, and means to expanding said diaphragm for providing yielding support against a flank pocket portion of the bacon slab.

11. In a press for pressing bacon slabs having flank pocket portions: a pair of relatively movable, flat, rigid platens for contacting and exerting pressure against the top and bottom of a bacon slab, a pair of flat, rigid side plates and a pair of flat, rigid end plates for exerting pressure respectively against the sides and ends of the bacon slab, and a pad composed of a resilient material mounted by one of said platens, so that said bacon slab can be yieldably supported at its flank pocket portion while said platens and said side and end plates exert pressure against said bacon slab.

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