Fig. 5.

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This invention relates to machines for sealing the bottom flaps of cartons, and more particularly to devices for applying pressure to such flaps to ensure the tightness of the seal therebetween after they have had adhesive applied thereto and have been folded into superposed relation.

One of the objects of the present invention is to provide a mechanism of novel construction for embossing in a carton bottom sealing machine by means of which a controlled pressure of predetermined amount may be applied to the bottom flaps of the cartons while the latter are in motion and in such a manner as to quickly effect a highly efficient seal.

Another object is to provide an improved bottom sealing device which is especially adapted for use with high speed, continuous motion carton making machinery.

A further object is to provide a novel form of mechanism for hydraulically applying relatively high sealing pressures to the bottom flaps of cartons as the latter are supported by and in movement on carton forming blocks or mandrels.

Still another object is to provide a device of the character just described wherein the sealing pressure is so applied to the bottom flaps of the cartons that no undue stresses are exerted upon the elements of the carton carrying mechanism and excessive wear of the parts is avoided.

A still further object is to provide a carton bottom sealing mechanism of new and improved construction which is efficient, dependable and rapid in operation, rugged in structure, and requires substantially less space for its installation than sealing devices of the character heretofore known to the art.

These and other objects will appear more fully upon a consideration of the detailed description of the embodiment of the invention which follows. Although only one particular form of machine is described and illustrated in the accompanying drawings, it is to be expressly understood that these drawings are for the purpose of illustration only and are not to be construed as defining the scope of the invention, reference being had for the latter purpose to the appended claims.

Referring now to the drawings, wherein like reference characters indicate like parts throughout the several views:

Fig. 1 is a plan view, somewhat diagrammatic in nature, of one form of carton bottom sealing machine embodying the present invention;

Fig. 2 is a side elevation of the machine shown in Fig. 1 with certain parts broken away and others omitted in order to show more clearly the pressure applying mechanism of the present invention;

Fig. 3 is a side elevation of the pressure applying mechanism of Fig. 2 viewing the mechanism from the opposite side;

Fig. 4 is a sectional view taken substantially on line 4—4 of Fig. 2 showing the pressure applying mechanism in end elevation and on an enlarged scale;

Fig. 5 is a sectional view, also on an enlarged scale, taken substantially on line 5—5 of Fig. 2;

Fig. 6 is a side elevation of the cam shaft of the disclosed embodiment of the invention indicating the manner in which the various elements of the mechanism are driven;

Fig. 7 is an axial sectional view through the master cylinder of the fluid pressure applying mechanism of the invention; and

Fig. 8 is an axial sectional view through the auxiliary cylinder of the fluid pressure system.

The mechanism of the present invention comprises primarily a carriage or slide member which is adapted to be moved back and forth in synchronism with the forming blocks or mandrels of a continuous motion carton bottom sealing machine, and one or more pressure applying members or plates supported on said carriage member and movable hydraulically into and out of contact with the glued and folded bottom flaps of the cartons as the latter are carried along on said blocks. In order to both enable high speed operation and reduce the space required for the mechanism, the carriage member is preferably provided with a plurality of pressure applying plates so that more than one carton may be operated upon at the same time; also, the use of fluid pressure operated means for applying the sealing pressure enables relatively high pressures to be employed, thereby decreasing the length of time required for application of the pressure and in turn decreasing the necessary length of travel of the pressure applying mechanism. The invention is further characterized by the fact that the pressure members contact both the tops and the bottoms of the carton forming blocks so as to avoid the application of unbalanced forces to the blocks and to the elements of their conveying mechanism.

While the sealing mechanism of the present invention may be used with carton forming machines of various constructions, it is particularly well adapted for use with the continuous motion type of machine wherein a plurality of vertically arranged carton forming blocks, carried by a
suitable conveyor mechanism, are adapted to receive carton blanks which have been opened out to the proper shape and placed on the blocks in any desired manner, and to carry said blanks with what will ultimately be the bottom flaps of the cartons upmost while said flaps receive a suitable coating of adhesive, are folded into superposed relation onto the upper ends of the blocks, and are then compressed against said block ends under relatively high pressure to insure a tight seal.

As shown best in Figs. 1, 2 and 4, a carton forming mechanism of this general character may comprise a pair of vertically spaced conveyors chains 11 having secured thereto at regularly spaced intervals therealong block supporting brackets 12 to which in turn are suitably connected the bases 13 on which are removably mounted the carton forming blocks 14. The conveyor chains 11 pass around sprocket wheels 15 and 16 so as to carry the carton forming blocks in a generally elliptical path as shown in Fig. 1, the sprocket wheel 15 being secured to a vertically arranged shaft 17 which is driven by means of a set of bevel gears 18 from a horizontal cam shaft 19 (Fig. 6) extending transversely across the entire machine. The cam shaft 19 is in turn driven from a clutch shaft 20 through a suitable chain and sprocket arrangement, the clutch shaft 20 deriving its power from a motor 22 through a belt and pulley drive 23. The cam shaft 19 not only provides the drive for the conveyor chains 11 and the carton forming blocks 14 supported thereon, but also controls the operation of all of the various elements of the carton feeding, adhesive applying and flap folding elements (not specifically shown) and the pressure applying mechanism of the present invention later to be described.

In order to assist the conveyor chains 11 in supporting the weight of the carton forming blocks and to insure the travel of the latter in a predetermined horizontal plane, the block supporting brackets 12 are provided with guide rollers 24 which travel in closed grooves or channels 25 formed in a raceway 26. The sprocket wheels, together with the bearings for shafts 19 and 20, are suitably supported by the main frame 27 of the machine.

As the carton forming blocks continuously move around their prescribed path of travel as indicated in Fig. 1, squared out carton blanks 28 are loaded onto the blocks in any suitable manner at station A (Fig. 1), at which time the flaps which will ultimately form the bottom of the carton stand in substantially upright position above the level of the top surfaces of the forming blocks 14. As each block then moves around in a clockwise direction, the front and rear bottom flaps are folded inwardly on top of the block and the side flaps are spread outwardly in position to receive coatings of adhesive from any suitable adhesive applying mechanism at the station B. As shown best in Fig. 4, the flaps at the other end of the carton—which will be the top of the carton in completed form—rest against suitable stops 29 secured to the lower portion of the forming block 14. After the adhesive has been applied and the flaps substantially as shown at C in Fig. 1, the continued movement of the forming blocks carries each carton around the end of the conveyor at which sprocket wheel 15 is located to the position D, at which point the adhesive bearing side flaps are folded inwardly on top of the already folded end flaps to the position indicated in Fig. 1. The folded flaps are now ready to be operated upon by the pressure applying mechanism of the present invention which is adapted to force the flaps against one another and against the top surfaces of the forming blocks 14 under relatively high pressure, and to maintain that pressure during a sufficient length of time to ensure a tight seal therebetween.

As shown in the drawings, the sealing operation is performed on two cartons simultaneously, and is completed during the travel of each carton through a distance equal to the center-to-center distance between adjacent forming blocks; that is, the entire pressure applying operation is effected within that portion of the path of the forming blocks indicated at E in Fig. 1. When each block reaches the station F, the bottom sealed carton blank is removed therefrom in any suitable manner, as by a blast of air through the hollow interior of the forming block 14 and its base 13.

In the specific embodiment disclosed, the pressure applying mechanism is mounted on a slide or carriage member 30, substantially rectangular in side elevation, which is slidably mounted for reciprocation on a slide bar 31 suitably supported by the main frame 27 of the machine in a position parallel to that portion of the path of travel of the carton forming blocks indicated at E in Fig. 1. The top and bottom edges of slide bar 31 are beveled as indicated at 32 and 33 in Fig. 4, the top edge 32 having a greater inclination with respect to the horizontal than the bottom edge 33 of the slide bar and a removable gusset 35 which bears against the top edge 32. With this construction, the carriage member 30 is supported on slide bar 31 for reciprocation therealong parallel to a portion of the path of travel of the carton forming blocks.

In order to move the carriage member 30 on slide bar 31, there is provided a bracket 36 which is suitably secured to and extends outwardly at right angles to the plane of the carriage member through an opening in the frame 27 of the machine, and to which is secured by a suitable knuckle joint 37 and stud 38 one end of a connecting rod 39 (Fig. 2). The other end of the connecting rod 39 is secured through another knuckle joint 40 to the upper end of a lever 41 which is fulcrummed intermediate its ends on a stud 42 (Fig. 6) carried by a portion of the frame 27. The lower end of lever 41 is provided with a cam roll 43 which projects into and travels in the groove of a closed cam 44 secured to cam shaft 45. Cam 44 is so designed that, through lever 41 and connecting rod 38, it reciprocates carriage member 30 back and forth on slide bar 31 in timed relation to the movements of the carton forming blocks 14, the extent of movement of
the carriage member in each direction being equal to the center-to-center distance between adjacent forming blocks and the speed of movement being synchronized with that of the forming blocks during the particular portion of the travel of the carriage member in the same direction as the forming blocks. The return movement of the carriage member is at a slightly higher rate of speed than the speed of movement in order to permit proper acceleration and deceleration of said member at the limits of its travel in the two directions.

Coming now to the means by which the sealing pressure is applied to the carton flaps, it will be seen from the drawings that the preferred embodiment of the invention is so constructed as to operate upon more than one carton at the same time, thereby lessening the speed at which the pressure applying mechanism must operate and increasing the length of time during which pressure may be applied to each carton. Although the mechanism may be so designed as to operate on only one carton at a time, the preferred construction herein disclosed is particularly well adapted for use with modern high speed, carton feeding and forming machinery.

As shown, carriage member 30 is provided at its upper corners with upwardly extending bosses 45 in which is journaled an upper fulcrum shaft 46. Adjustably secured to shaft 46 adjacent one of the bosses 45 is a pressure applying member 47 having an arm 48 extending inwardly over the path of travel of the carton forming blocks 14 and a second or actuating arm 49 extending outwardly beyond the side members of the machine frame 27 to a point overhanging the outer end of carriage bracket 35. The inner end of the arm 48 of pressure applying member 47 is substantially rectangular in plan view, as shown in Fig. 1, and of greater area than that of the folded flaps of one of the carton blanks 28. To the bottom surface of this portion of the arm 48 is secured a pressure pad 50, of any suitable material such as rubber, this pad also having its bottom surface covered by a metallic plate 51 which serves as the supporting element of the pressure applying member.

Shaft 46 is so located that its axis is substantially coplanar with the uppermost of the folded flaps of the cartons carried by forming blocks 14; pressure applying member 47 is then so constructed and so adjusted on shaft 46 that the bottom surface of plate 51, when horizontal, lies slightly below the axis of shaft 46 so as to force a compression of the carton flaps against the upper ends of the forming blocks 14. Pressure applying member 47 and shaft 46 are normally urged in a counterclockwise direction, as viewed in Fig. 4, by means later to be described to a position wherein the pressure plate 51 is elevated slightly out of contacting position with the carton flaps, as indicated by the broken lines in Fig. 4. When the pressure applying member 47 is in this elevated or released position, it may move with carriage member 30 in a direction opposite to that of the carton forming blocks without engaging the carton flaps.

Upper fulcrum shaft 46 also carries adjacent the other boss 45 a second pressure applying member 52 similar in construction to member 47 except that the actuating arm 49 is omitted. In order that the second pressure applying member 52 may be properly adjusted on shaft 46 so as to exert exactly the same amount of pressure on the flaps of the cartons upon which it operates as that applied by member 47, in spite of slight variations which may occur in machining and assembling the mechanism, means are provided for definitely fixing the position of member 52 before it is clamped to the shaft 46. To this end, there is fixedly secured to shaft 46 the circular plate 55, the outer end of which overlies the top surface or back of pressure applying member 52 and is threaded to accommodate an adjusting screw 54, the lower end of the latter being adapted to engage a seating surface 53 formed on the top of pressure applying member 52. With this construction, a micrometric adjustment may be made on the position of pressure applying member 52 on shaft 46 so as to properly adjust said member relatively to pressure applying member 47.

When the pressure applying members 47 and 52 are actuated to compress the carton flaps against the upper ends of the forming blocks 14, it is evident from Fig. 4 that forces are applied to the conveyor mechanism of the forming blocks (particularly to the conveyor chains 14, guide rollers 24 and raceway 25) which, if unopposed, would tend to cause excessive wear of the parts and to throw excessive stresses thereon. The mechanism of the present invention therefore includes means for compensating for or balancing these forces applied to the tops of the carton forming blocks by exerting similar forces against the bottoms of the blocks.

In the embodiment illustrated, this result is accomplished by providing the carriage member 30 with a pair of downwardly projecting bosses 54 in which is journaled a lower fulcrum shaft 57, this shaft having secured thereon pressure applying members 58 and 59 which, except for the slight changes necessary to permit their use in inverted position, are of substantially the same construction as pressure applying members 47 and 52, respectively. If desired, shaft 51 may also be provided with an arrangement similar to arm 53 and adjusting screw 54 for accurately adjusting the position of pressure applying member 59 with respect to member 58. As shown in Fig. 4, the lower pressure applying member 59 is provided with an actuating arm 60 similar to the arm 49 of upper pressure applying member 47. Bottom fulcrum shaft 57 and pressure applying members 58 and 59 are so constructed and arranged that the pressure plates 61 thereof normally lie below and out of contact with the bottom ends of forming block bases 13.

In order to normally urge the upper and lower pressure applying members to positions in which they are out of contact with the carton flaps and the forming block bases, respectively, the outer end of each of actuating arms 49 and 60 may be provided with a stud 61 to which is secured one end of a tension spring 63, the opposite ends of said springs being secured to studs 63 carried by the outer end of carriage bracket 35. The springs 63 thus yieldingly urge the upper and lower fulcrum shafts 46 and 57 in counterclockwise and clockwise directions, respectively, so as to move the pressure applying members to inoperative or released position. In order to limit the extent of movement of actuating arms 49 and 60 under the influence of springs 62 suitable stop means are
provided. As shown best in Figs. 2 and 4, the outer end of actuating arm 49 is provided with a horizontally extending stud 64 which is adapted to contact the upper end of an adjusting screw 55 carried by a bracket 66 mounted on a horizontal web 67 of the carriage bracket 36. The normal or operative position of the lower actuating arm 66 is likewise fixed by an adjusting screw 68 carried by a downwardly depending bracket 69 secured to a vertical web 70 of carriage bracket 36, the lower end of adjusting screw 68 being adapted to contact the upper surface of the actuating arm 66 intermediate its ends.

In order to obtain relatively high sealing pressures in a simple and efficient manner, and in order to permit the pressure to be varied easily and accurately, the pressure applying mechanism of the present invention is hydraulically or fluid pressure operated. In the embodiment illustrated, there is secured to the carriage bracket 36 in any suitable manner a vertically arranged cylinder 71 open at both ends and receiving a pair of opposed pistons 72 and 73. Fluid tight joints between the pistons 72 and 73 and the inner wall 74 of cylinder 71 are insured by providing the face of each piston with a sealing cup 76 of any suitable flexible material, such as rubber, each cup being reinforced with a spring metal cup 78 which holds the flanges of the sealing cup 74 against the cylinder wall. The sealing cups are held tightly against the faces of the pistons by means of a compression spring 76 interposed between the pistons and thrusting at both ends against the spring metal cups 78. The operating fluid, which is preferably the same composition as that commonly used in the hydraulic brake systems of automotive vehicles, is supplied to the space within the cylinder 71 between the upper and lower pistons 72 and 73 through a fitting 77 threaded into the wall of the cylinder and connected at its outer end to a flexible tube 78 leading to a source of fluid pressure later to be described. The cylinder 71 may also be provided with a bleeder vent 79 (Fig. 1) for use when filling the pressure system with fluid.

The upper piston 72 is loosely connected, as by a substantially hemispherical bearing seat 80, with the upper end of a connecting rod 81, the upper end of which is slidably received within the socket portion 82 of a knuckle joint 83 pivotally connected to the lower end of actuating arm 49 of pressure applying member 47. Connecting rod 81 also has fixed thereto adjacent its lower end a collar 84 between which and the lower end 35 of, knuckle socket 83 is interposed a compression spring 89. With this construction, should any undue resistance be offered to the movement of members 47 and 82 toward pressure applying position, compression of the spring 89 and sliding movement of connecting rod 81 relatively to knuckle socket 83 will permit movement of the upper piston 72 to the lower end of which is threaded into the socket portion 88 of a knuckle joint 89 pivotally connected to the outer end of the actuating arm 60 of pressure applying member 55.

The lower piston 73 is also loosely connected, as by a hemispherical bearing seat 90, to the upper end of a connecting rod 97 the lower end of which is threaded into the socket portion 98 of a knuckle joint 99 pivotally connected to the outer end of the actuating arm 70 of pressure applying member 55.

The lower upper and ends, respectively, of connecting rods 81 and 97 are continually urged into their bearing seats 80 and 90, and the pistons 72 and 73 are continually urged toward one another, by means of the tension springs 82 previously described. In this way, the upper and lower pressure applying members are normally urged toward inoperative or released position so that the carriage member 36 is free to move independently of the carton forming blocks. In order to move the pressure applying members into pressure contact with the carton flaps and the bottoms of the forming blocks, the pistons 72 and 73 are urged outwardly from one another through connecting rods 81 and 87 and knuckle joints 83 and 99, moving actuating arm 49 and 60 in clockwise and counterclockwise directions respectively, against the tension of springs 62, thereby rotating upper and lower fulcrum shafts 46 and 57 and the pressure applying members secured thereto in such directions as to bring the latter into operative position.

The mechanism by which an accurately determinable, variable fluid pressure is transmitted to the pistons 72 and 73 in cylinder 71 is shown best in Figs. 1, 2, 7 and 8. As there illustrated, a master pumping cylinder 90 is secured in any suitable manner to the frame 21 in a position slightly inclined with respect to the horizontal, its uppermost or left-hand end as viewed in Fig. 2 being the outlet or pressure end of the cylinder and having a fitting 91 communicating with the interior thereof and connected to the lower end of flexible tube 78 which supplies fluid to the cylinder 71. Within the master pumping cylinder 90 there is a piston 92 provided with a flexible sealing cup 93 and spring metal cup 94 similar to those previously described in connection with pistons 72 and 73. The piston 92 is loosely connected, as by a spherical bearing seat 95, with one end of a connecting rod 96, there being a spring 97 within the cylinder 90 interposed between the piston 92 and the cylinder cap so as to continually maintain contact between the bearing seat 95 and the associated end of connecting rod 96. The rod 96 is slidable supported for movement in a fixed path by guides 98 secured to the machine frame 27, and is connected at its other end by means of a knuckle joint 99 and link 100 to the upper end of a lever 101 the lower end of which is fulcrumed on a stud 102 carried by a bracket 103 secured to the frame 21. Lever 101 is provided with a slot 104 intermediate its ends in which is adjustably housed a stud 105 having pivoted thereon one end of a connecting yoke 106. The forked end of yoke 106 embraces cam shaft 19 and carries a cam roll 101 which projects into and travels in the groove of a closed cam 109 fixed to cam shaft 19.

Cam 108 is so designed and so adjusted on shaft 19 relatively to carriage actuating cam 44 so that the movements of the pressure applying members and the member 36 are synchronized with one another and with the movements of the carton forming blocks. For example, in one specific embodiment of the present invention, the carton forming blocks have a center-to-center distance of twelve inches and the machine is operated at a speed of one hundred and sealed cartons per minute. In this machine, the cams 44 and 108 are so designed that the carriage member 36 has a total travel of twelve inches in each direction; of the twelve inches of movement in the same direction with the forming blocks, the first two inches are utilized to bring the carriage member up to the
same speed as that of the block, the next eight inches of travel of the carriage are in exact synchronism with the blocks, while the last two inches are utilized for decelerating the forward movement of the carriage and bringing it to a momentary stop before it begins its return travel which, as previously indicated, is at a higher rate of speed than the speed of movement of the forming blocks. The cam 108 is so designed that its pressure stroke is initiated at approximately the same time that the carriage member starts its forward movement. However, the piston 92 of the master pumping cylinder 89 does not reach the limit of its power stroke so as to exert full pressure in the pressure applying members until the carriage member is moving in exact synchronism with the carton forming blocks. Piston 92 is then maintained stationary so as to apply full pressure until the carriage member starts to decelerate. In the last two inches of its forward travel, whereupon the connecting rod 96 is given its return stroke by the cam 108, the piston 92 following the rod due to the fact that the springs 62 associated with actuating arms 49 and 50 move the pistons 72 and 73 of cylinder 71 toward one another and thereby force the fluid of cylinder 71 through tube 78 back into master cylinder 90. The piston 92 then remains stationary at the limit of its suction stroke during the return movement of the carriage member.

The cross sectional area of the inside of master pumping cylinder 90 is approximately five hundredths of that of cylinder 71. With this construction, the total pressure to which the parts associated with the master cylinder are subjected may be maintained substantially lower than the total pressure transmitted by the pistons 72 and 73 to the pressure applying members 47, 52, 53 and 58. By making the stud 105 of connecting yoke 106 adjustable in slot 105 of lever 101, it is possible to accurately adjust the length of the power stroke of piston 92 in master pumping cylinder 90 and thereby vary the total pressure created in the fluid system. In this way, sealing pressures may be obtained as high as 1200 pounds per square inch of carton flap surface, although for ordinary circumstances the system is usually adjusted to produce a sealing pressure of approximately 250 pounds per square inch.

In order to prime the fluid system and accurately adjust the same to the desired starting pressure, there is provided an auxiliary cylinder 109 and a supply tank 110, both of which are suitably mounted on the machine frame 27 as indicated best in Fig. 2. The supply tank 110 may be of the same construction as the so-called reserve tanks of hydraulic brake systems already known, embodying a normally closed valve which is opened by a handle 111 and spring 112 whenever it is desired to let fluid into the pressure system. The outlet of supply tank 110 is connected by a conduit 113 to the interior of auxiliary cylinder 109, the latter also being connected to the pressure end of master pumping cylinder 90 by a conduit 116. The auxiliary cylinder 109 is closed at its pressure end by a cap 115. A conduit 114, so connected as to have a central threaded bore through which passes a threaded rod 117. To the inner end of rod 117 there is connected a piston 118, while to its outer end there is secured thereto a hand wheel 119; the connection between piston 118 and rod 117 being made with a flexible material secured to the face of the piston.

To fill the fluid system to the desired starting pressure, hand wheel 119 of auxiliary cylinder 109 is rotated in the proper direction to withdraw the piston 118 outwardly as far as it will go. The value of supply tank 110 is then opened and fluid from said tank is permitted to flow downwardly therefrom until the system is full; the supply tank valve is then re-closed to prevent the return of fluid into the tank. Hand wheel 119 of auxiliary cylinder 109 is then rotated in the opposite direction to force the piston 118 inwardly so as to build up the pressure in the system, including that in master pumping cylinder 90 and cylinder 71, until the desired starting pressure is attained. In order to enable an accurate determination of this pressure, the pressure end of master cylinder 90 is provided with a fitting 121 to which is connected a conduit 122 leading to a pressure gauge 123 mounted on the frame 27. The gauge 123 may also be utilized for observing the variations in pressure in the fluid system during operation of the machine so that further adjustment may be made either by means of auxiliary cylinder 109 or by the studding and slot connection between connecting yoke 105 and lever 101. If desired, gauge 123 may be provided with a pet cock 124 in order that it may be shut off from communication with the pressure system and its indicating mechanism thereby relieved of the rapid variations in pressure which occur in the system during normal operation of the carton sealing machine. Although the operation of the machine embodying the present invention should be clear from the foregoing description of the various elements thereof, it may be summarized as follows: 40

Carton blanks are loaded onto forming blocks 14 at station A (Fig. 1) in any desired manner, at which time the bottom flaps of the cartons stand upright above the tops of blocks 14. Continuous movement of the forming blocks carries the cartons past adhesive applying and flap folding devices of any suitable construction located at stations B and D, with the result that, when the cartons reach position D, the bottom flaps have had adhesive applied thereto and have been folded into a position such that the top of the upper of the forming blocks ready for the application of the sealing pressure thereon. The cartons are then moved through the space indicated as station E, during which portion of their travel the upper set of pressure applying members 47 and 52 tightly compress the flaps against the upper ends of the forming blocks, while the lower set of pressure applying members 55 and 59 contact the bottoms of the forming blocks so as to balance the forces exerted on the tops thereof by the upper set of pressure applying members.

During the time of application of the sealing pressure, the carriage member 30 moves in synchronism with the forming blocks, the total travel 65 of the carriage member in each direction being substantially equal to the center-to-center distance between adjacent blocks 14, each having a central threaded bore through which passes a threaded rod 117. To the inner end of rod 117 there is connected a piston 118, while to its outer end there is secured thereto a hand wheel 119; the connection between piston 118 and rod 117 being made with a flexible material secured to the face of the piston 118 at a time; the length of time during which the 75
sealing pressure is applied is likewise twice as long as would be possible with a single set of pressure applying members.

As has already been explained, the carrier actuating cam 108 are so designed and adjusted relatively to one another and to the conveyor mechanism of the lower forming blocks that, during each forward stroke of the carriage member, the latter is first accelerated to the speed of the forming blocks, then travels at the same speed with the blocks for a predetermined portion of their movement, and then decelerates to a stop before the return stroke. During the accelerating portion of the forward travel of the carriage member, the pressure in the system is gradually increased so as to move the pressure applying members from their normal inoperative or released positions to their operative or pressure contact positions, full pressure being applied only during the time that the carriage is moving in exact synchronism with the blocks and being released during the deceleration period so as to again move the pressure applying members to inoperative or released positions by the time that the carriage member reaches the limit of its forward movement. During the return stroke of the carriage member, the pressure in the system is maintained at its minimum value and the pressure applying members remain in their released positions so as to clear the cartons and forming blocks without contact.

If desired, the pressure applying mechanism may be provided with suitable means for insuring the retention of the folded carton flaps in proper position from the time that the cartons leave the flap folding position D until the pressure applying members are moved into pressure contact therewith for the sealing operation. In the embodiment illustrated, this result is accomplished by mounting a pair of flap holddown members 125 and 126 on pressure applying member 47 in the manner indicated in Figs. 1 and 3, the member 125 extending toward the flap folding station D, while member 126 extends in the opposite direction over the major portion of the space between pressure applying members 47 and 52. It will be understood that hold-down members 125 and 126 are so shaped and so located as to contact the uppermost flaps of the cartons during the travel of carriage 30 in the direction opposite to that in which the carton forming blocks are moving, and to retain the flaps in their properly folded position during this portion of the cycle of the mechanism.

After the sealing pressure is released, the cartons continue to travel on the forming blocks until position F is reached, at which point the bottom sealed cartons are removed from the blocks in any suitable manner, as by an air blast.

There is thus provided by the present invention an improved form of mechanism for sealing the bottom flaps of cartons which is particularly well adapted for use with high speed, continuous moving forming machinery. With the mechanism herein disclosed, a controlled pressure of predeterminable amount may be applied to the bottom flaps of cartons while the latter are in motion, and the applied pressure may be readily varied to meet the different conditions which arise in practice. By using fluid pressure for actuating the pressure applying members of the sealing mechanism, it is possible to attain relatively high pressures and to accurately regulate the same, an advantage which is reflected in the fact that high efficient sealing may be obtained with only a relatively short time of application of the pressure and a relatively short travel of the pressure applying mechanism. By the same token, the mechanism of the present invention requires substantially less installation space than sealing devices of the character heretofore known to the art. For example, one hundred cartons per minute may be bottom sealed with a pressure applying mechanism of the construction herein disclosed having a total travel of only twelve inches, whereas in one of the standard sealers heretofore known thirty-nine inches of space was required for the sealing operation with an output of only sixty cartons per minute. A further advantage of the mechanism of the present invention resides in the fact that the carton forming blocks are actually gripped between the upper and lower sets of pressure applying members and are not subjected to unbalanced forces which tend to place undue stress on, and cause excessive wear of, the various elements of the machine.

While only one particular form of the invention has been described and illustrated in the accompanying drawings, it will be obvious that the invention is not limited to the exact structure shown but is capable of a variety of mechanical embodiments. For example, the pressure applying mechanism may be readily adapted for use with carton forming machines in which the cartons are carried in other than vertical position with the bottom flaps uppermost. It is also evident that the number of pressure applying members might be increased with an attendant reduction in the required size and weight of the sealing mechanism and an increase in the length of time during which the sealing pressure may be applied. It is likewise contemplated that, if desired, the pressure applying members which contact the carton flaps may be provided with suitable heating means so as to facilitate drying of the adhesive with which the flaps are sealed. Various other changes, which will now suggest themselves to those skilled in the art, may be made in the form, details of construction and arrangement of the parts without departing from the spirit of the invention. Reference is therefore to be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. In a machine for bottom sealing cartons, a plurality of continuously movable forming blocks adapted to receive and carry carton blanks with the bottom flaps of said blanks uppermost above the top surfaces of said blocks, means for applying adhesive to said flaps, means operative subsequently to the adhesive applying means for folding said flaps into superposed position over the top surfaces of said forming blocks, and means for applying pressure to said folded flaps to insure the sealing together thereof, said pressure applying means including a member movable into contact with the top surface of each carton and adapted to compress the folded flaps thereof against the top surface of the forming block, fluid pressure operated means for moving said member into pressure applying position, and means for reciprocating said pressure applying means parallel to a portion only of the path of movement of said forming blocks, whereby said means is cyclically operative upon the flaps of cartons carried by successive forming blocks.

2. In a machine for bottom sealing cartons of the type wherein the carton blanks are sup-
5. In a carton bottom sealing machine, a plurality of continuously movable forming blocks each adapted to support thereon a carton blank having adhesive bearing flaps folded over into superposed relation against one end of said blank, a carriage member movable in timed relation to said blocks, a pressure applying member mounted on said carriage member, and fluid pressure operated means for moving said pressure applying member into pressure contact with the folded bottom flaps of one of said cartons while said carriage is moving in synchronism with said blocks.

6. In a carton bottom sealing machine, a plurality of continuously movable forming blocks each adapted to support thereon a carton blank having adhesive bearing flaps folded over into superposed relation against one end of said blank, a carriage member movable in timed relation to said blocks, a pressure applying member mounted on said carriage member, and fluid pressure operated means for moving said pressure applying member into pressure contact with the folded bottom flaps of one of said cartons while said carriage is moving in synchronism with said blocks.

7. In a carton bottom sealing machine, a plurality of continuously movable forming blocks each adapted to support thereon a carton blank having adhesive bearing flaps folded over into superposed relation against one end of said blank, a carriage member movable in timed relation to said blocks, a pressure applying member mounted on said carriage member, and fluid pressure operated means for moving said pressure applying member into pressure contact with the folded bottom flaps of one of said cartons while said carriage is moving in synchronism with said blocks.

8. In a carton bottom sealing machine, a plurality of continuously movable forming blocks each adapted to support thereon a carton blank having adhesive bearing flaps folded over into superposed relation against one end of said blank, a carriage member movable in timed relation to said blocks, a pressure applying member mounted on said carriage member, and fluid pressure operated means for moving said pressure applying member into pressure contact with the folded bottom flaps of one of said cartons while said carriage is moving in synchronism with said blocks.

9. In a carton bottom sealing machine, a plurality of continuously movable, vertically arranged forming blocks each adapted to support thereon a carton blank having adhesive bearing flaps folded over into superposed relation against the top of said blank, a pressure applying member movable in a path parallel to at least a portion of the path of travel of said blank, means for lowering said member into pressure contact with the flaps of one of said cartons during a predetermined portion of the path of travel of said blank, and means for maintaining said member in synchronism with said blocks.

10. In a carton bottom sealing machine, a plurality of continuously movable, vertically arranged forming blocks each adapted to support thereon a carton blank having adhesive bearing flaps folded over into superposed relation onto the top of said blank, a pressure applying member movable in a path parallel to at least a portion of the path of travel of said blank, means for lowering said member into pressure contact with the flaps of one of said cartons during a predetermined portion of the path of travel of said blank, and means for maintaining said member in synchronism with said blocks.
blocks and out of contact with said folded flaps, and fluid pressure operated means for forcing said member downwardly to compress the flaps of one of said cartons against the top of its associated block during a predetermined portion of the travel of said member in synchronism with said blocks.

11. In a carton bottom sealing machine, a plurality of continuously movable, vertically arranged forming blocks each adapted to support thereon a carton blank having adhesive bearing flaps folded over into superposed relation onto the top of said block, a pressure applying member movable in a path parallel to at least a portion of the path of travel of said blocks, means for moving said member in timed relation to said blocks, means normally urging said member into raised position above the tops of said blocks and out of contact with said folded flaps, means for lowering said member into pressure contact with said flaps to compress the latter against the tops of said blocks during a predetermined portion of the travel of said member in synchronism with said blocks, and means for balancing the force exerted by said member against the tops of said blocks during said pressure applying operation.

12. In a carton bottom sealing machine, a plurality of continuously movable, vertically arranged forming blocks each adapted to support thereon a carton blank having adhesive bearing flaps folded over into superposed relation onto the top of said block, a pressure applying member movable in a path parallel to at least a portion of the path of travel of said blocks, means for moving said member in timed relation to said blocks, means normally urging said member into raised position above the tops of said blocks and out of contact with said folded flaps, means for lowering said member into pressure contact with said flaps during a predetermined portion of the travel of said member in synchronism with said blocks, and means for balancing the force exerted by said member against the tops of said blocks during said pressure applying operation.

13. In a carton bottom sealing machine, a plurality of continuously movable, vertically arranged forming blocks each adapted to support thereon a carton blank having adhesive bearing flaps folded over into superposed relation onto the top of said block, a pressure applying member movable in a path parallel to at least a portion of the path of travel of said block, a pressure applying member movable in a path parallel to at least a portion of the path of travel of said block, and fluid pressure operated means for simultaneously moving said members into pressure contact with the ends of one of said blocks during a predetermined portion of the travel of the latter, the upper of said pair of members compressing said carton flaps against the top end of said block and the bottom member engaging the bottom of said block and balancing the force applied to the top thereof by said upper member.

14. In a carton bottom sealing machine, a plurality of continuously movable, vertically arranged forming blocks each adapted to support thereon a carton blank having adhesive bearing flaps folded over into superposed relation onto the top of said block, a pressure applying member movable in a path parallel to at least a portion of the path of travel of said block, means for moving said members in timed relation to said blocks, means normally urging said members into positions above and below the top and bottom ends of said blocks, and fluid pressure operated means for simultaneously moving said members into pressure contact with the ends of one of said blocks during a predetermined portion of the travel of the latter, the upper of said pair of members compressing said carton flaps against the top end of said block and the bottom member engaging the bottom of said block and balancing the force applied to the top thereof by said upper member.

15. In a carton bottom sealing machine, a plurality of continuously movable, vertically arranged forming blocks each adapted to support thereon a carton blank having adhesive bearing flaps folded over into superposed relation onto the top of said block, a pressure applying member movable in a path parallel to at least a portion of the path of travel of said block, and fluid pressure operated means for simultaneously moving said members into pressure contact with the ends of one of said blocks during a predetermined portion of the path of travel of the latter, the upper of said pair of members compressing said carton flaps against the top end of said block and the bottom member engaging the bottom of said block and balancing the force applied to the top thereof by said upper member.

16. In a mechanism for applying sealing pressure to the adhesive bearing, folded flaps of cartons, the combination of a movable carriage, a pressure applying member mounted on and movable with said carriage, means normally urging said member into inoperative position and fluid pressure operated means for moving said member into pressure applying position during a portion of the movement of said carriage.

17. In a mechanism for applying sealing pressure to the adhesive bearing, folded flaps of cartons, the combination of a movable carriage, a pressure applying member pivotally mounted on and movable with said carriage, yieldable means normally urging said member into inoperative position, and fluid pressure operated means for moving said member into pressure applying position during a portion of the movement of said carriage.

18. In a mechanism for applying sealing pressure to the adhesive bearing, folded flaps of cartons, the combination of a movable carriage, a pressure applying member pivotally mounted on and movable with said carriage, yieldable means normally urging said member into inoperative position, and fluid pressure operated means for moving said member into pressure applying position during a portion of the movement of said carriage, including a cylinder mounted on said carriage, a piston in said cylinder operatingly connected to said pressure applying member, and means for forcing fluid into said cylinder in timed relation to the movements of said carriage.
19. In a mechanism for applying sealing pressure to the adhesive bearing folded flaps of cartons, the combination of a reciprocable carriage, a shaft mounted on said carriage with its axis parallel to the line of reciprocation of said carriage, a pressure applying member mounted on said shaft, means for normally rotating said member about the axis of said shaft into inoperative position, and means operative during a predetermined portion of the reciprocating movement of said carriage for moving said member into pressure applying position.

20. In a mechanism for applying sealing pressure to the adhesive bearing folded flaps of cartons, the combination of a plurality of continuously moving forming blocks each adapted to support thereon a carton blank having adhesive bearing folded flaps, a carriage reciprocable in a path parallel to at least a portion of the path of travel of said blocks, a shaft mounted on said carriage with its axis parallel to the line of reciprocation of said carriage, a pair of pressure applying members mounted on said shaft at spaced points therealong, the distance between said members being equal to that between adjacent cartons, means for normally rotating said members about the axis of said shaft into inoperative position, and means operative during a predetermined portion of the reciprocating movement of said carriage for moving said members into pressure applying position.

21. In a mechanism for applying sealing pressure to the adhesive bearing folded flaps of cartons, the combination of a plurality of continuously moving forming blocks each adapted to support thereon a carton blank having adhesive bearing folded flaps, a carriage reciprocable in a path parallel to at least a portion of the path of travel of said blocks, a pair of vertically spaced shafts mounted on said carriage with their axes parallel to the line of reciprocation of said carriage, the vertical distance between said shafts being substantially equal to the height of said carton forming blocks, a pressure applying member mounted on each of said shafts, means for normally rotating said members about the axes of said shafts into inoperative position, and means operative during a predetermined portion of the reciprocating movement of said carriage for moving said members into pressure applying position.

22. In a mechanism for applying sealing pressure to the adhesive bearing folded flaps of cartons, the combination of a plurality of continuously moving forming blocks each adapted to support thereon a carton blank having adhesive bearing folded flaps, a carriage reciprocable in a path parallel to at least a portion of the path of travel of said blocks, a pair of vertically spaced shafts mounted on said carriage with their axes parallel to the line of reciprocation of said carriage, the vertical distance between said shafts being substantially equal to the height of said carton forming blocks, a pair of pressure applying members mounted on each of said shafts at spaced points therealong, the distance between the members of each of said pairs being equal to that between adjacent cartons, means for normally rotating all of said members about the axes of said shafts into inoperative position, and means operative during a predetermined portion of the reciprocating movement of said carriage for simultaneously moving all of said members into pressure applying position.

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