Nov. 6, 1962 B. H. OXBORROW 3,062,105

MACHINE FOR SETTING-UP CARTONS

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Fig. 1.

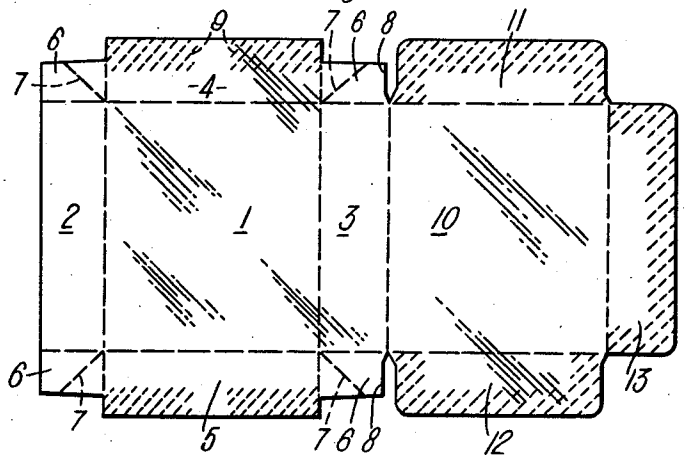
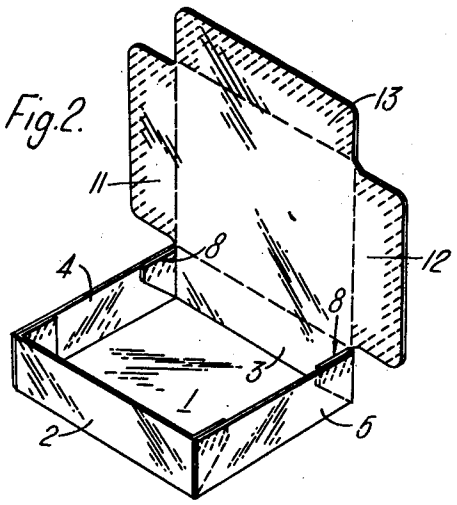


Fig. 2.



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MACHINE FOR SETTING-UP CARTONS

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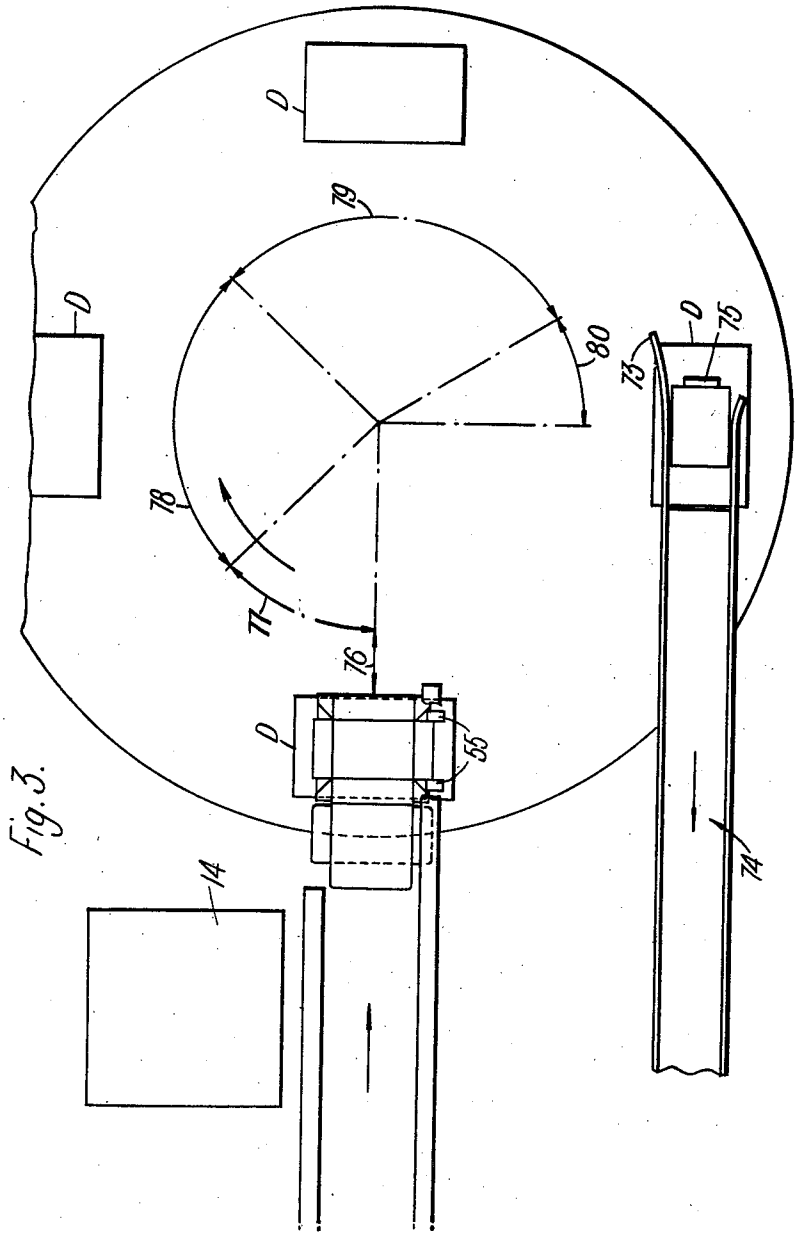


Fig. 3.

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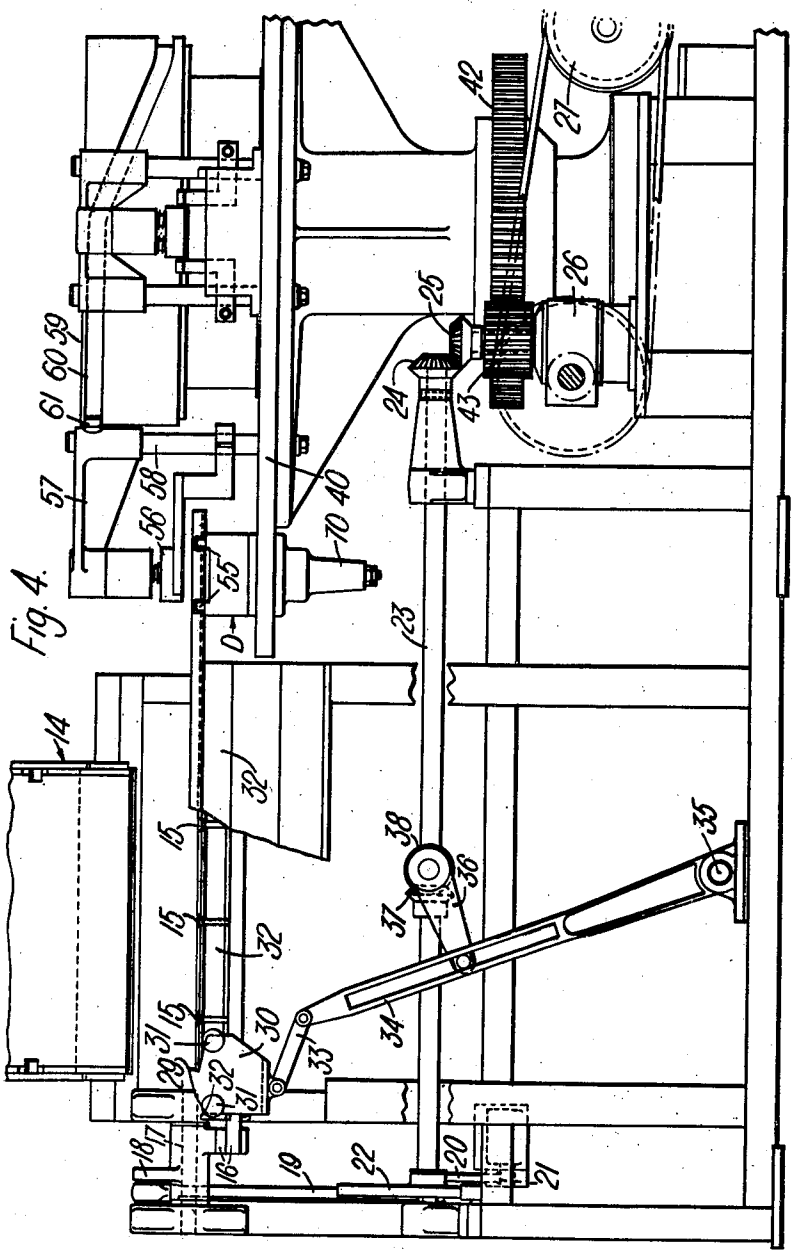
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MACHINE FOR SETTING-UP CARTONS

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Fig. 4.



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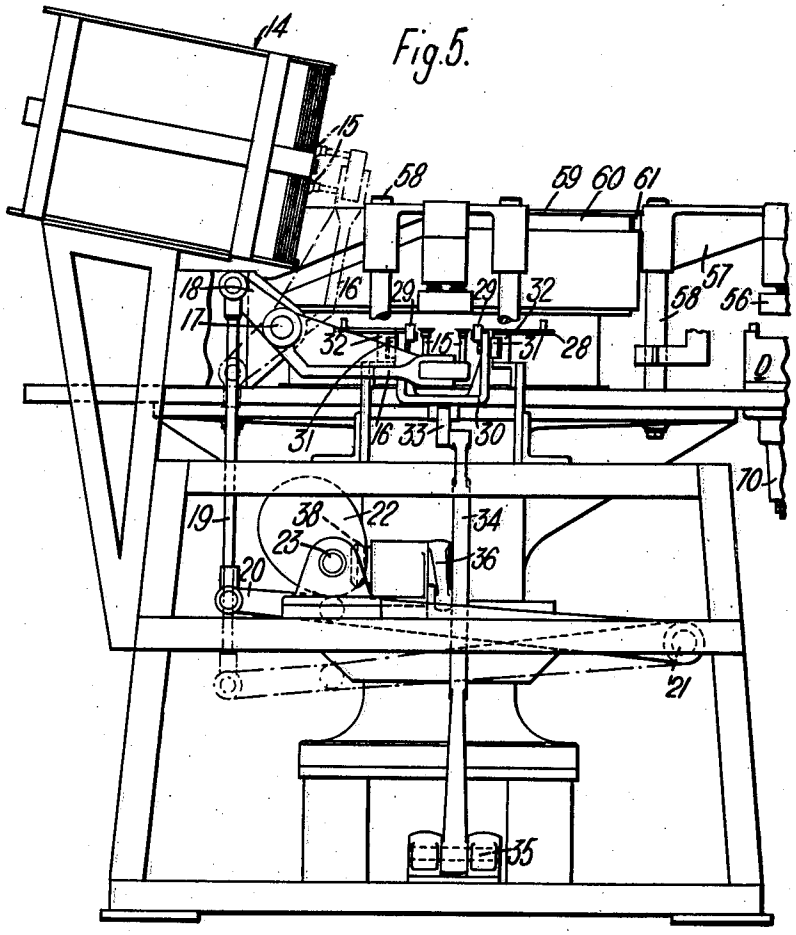
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Fig. 5.



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MACHINE FOR SETTING-UP CARTONS

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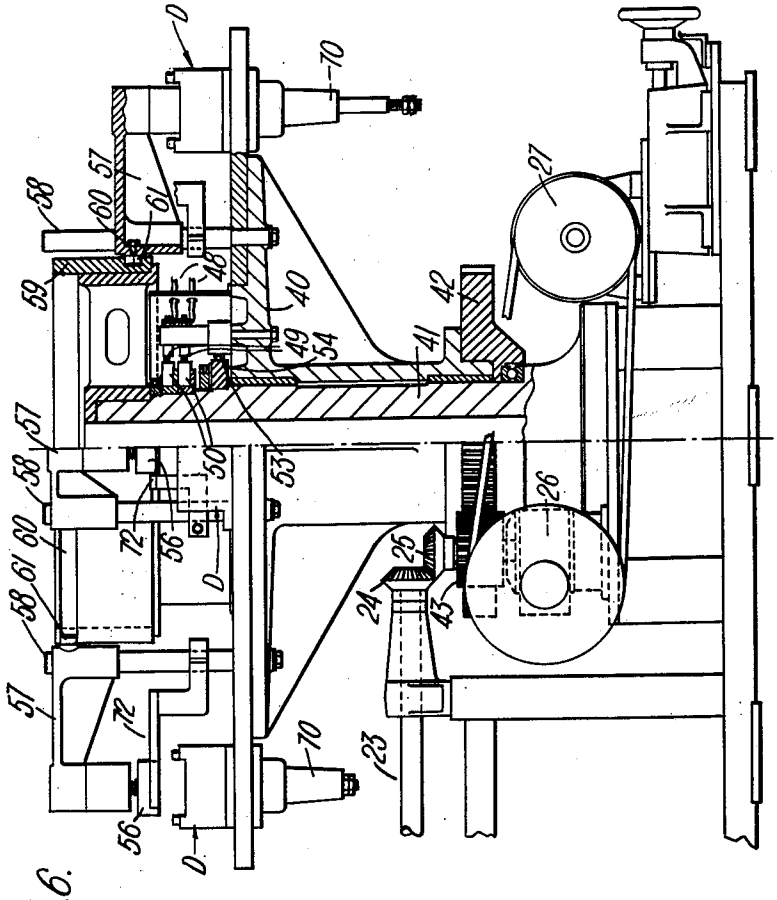


Fig. 6.

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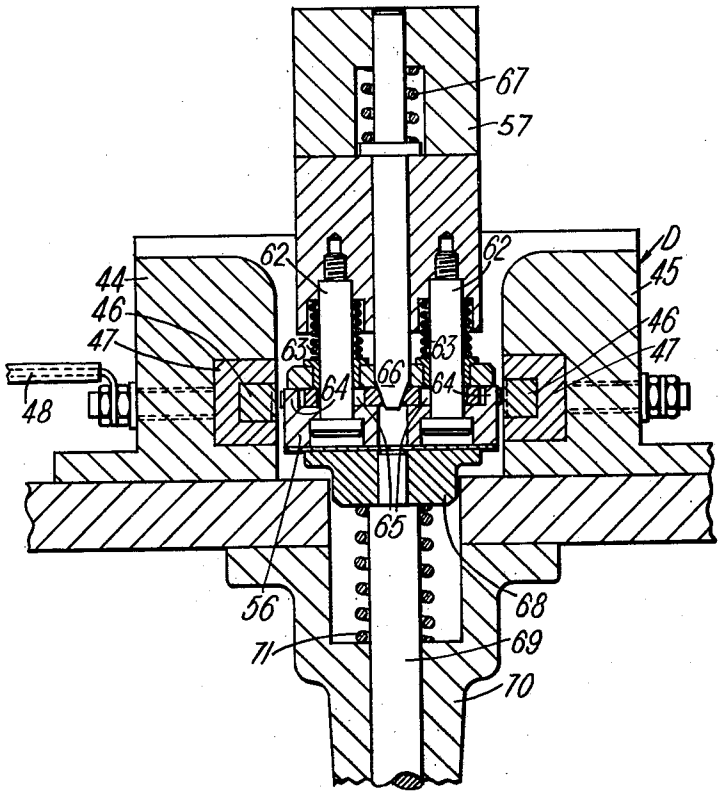
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MACHINE FOR SETTING-UP CARTONS

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Fig. 7.



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MACHINE FOR SETTING-UP CARTONS

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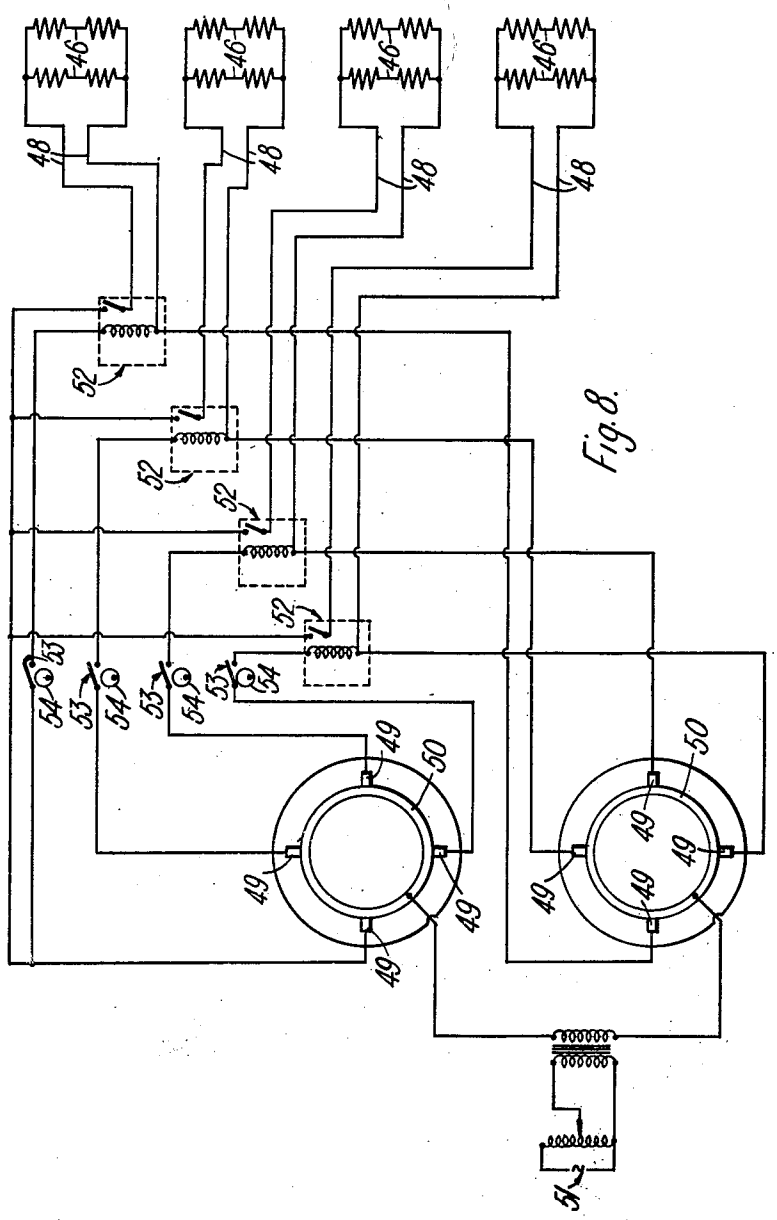


Fig. 8.

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MACHINE FOR SETTING-UP CARTONS

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Claims priority, application Great Britain Aug. 13, 1959
15 Claims. (Cl. 93—51)

This invention relates to an improved machine for setting-up a carton from a blank which includes body-forming sides to be secured in the set-up position thereof by the application of heat and pressure to overlying side-forming portions of the blank having a heat-sealable material therebetween and pre-applied to the blank.

It is a main object of the present invention to provide a machine for setting-up cartons of the kind mentioned above, which machine is relatively simple in operation and is capable of producing set-up cartons at a rate of 100 or more per minute.

According to the invention there is provided a machine for setting-up a carton from a blank which includes a body-forming side to be secured in the set-up position thereof by the application of heat and pressure to overlying side-forming portions of the blank having a heat-sealable material therebetween and pre-applied to the blank, said machine comprising a plurality of equi-spaced dies and punches appropriate thereto supported for simultaneous movement in one direction, heater means and pressure-applying means co-operating with each die and arranged to apply pressure and heat to overlying side portions of a carton set-up in the die, blank-feeding means operable to feed blanks in succession to said dies, ejector means movable with each said die to remove a set-up carton from the die, and actuating means co-operating with said punches and ejector means to effect operation thereof in timed relation one with the other in a maner such that a punch is operable to press a blank into the die appropriate thereto and the ejector means for the die is operable to remove a set-up carton from the die after heat and pressure have been applied to the carton for a predetermined interval of time.

In order that the invention may be clearly understood one embodiment thereof will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 illustrates one form of blank which can be set-up by a machine according to the invention,

FIGURE 2 illustrates the blank of FIGURE 1 in the set-up condition thereof,

FIGURE 3 is a diagrammatic top plan of a machine according to the invention,

FIGURE 4 is a side-elevation illustrating mechanism by which blanks are fed to the machine,

FIGURE 5 is a view looking in the direction of arrow V, FIGURE 4,

FIGURE 6 is an elevation, partly in section, of the blank setting-up mechanism,

FIGURE 7 illustrates to an enlarged scale a part of the mechanism shown in FIGURE 6, and

FIGURE 8 is a circuit diagram illustrating the electrical connections to heater devices included in the setting-up mechanism.

Referring to FIGURES 1 and 2 the blank from which a carton is to be set-up comprises a carton body portion having a rectangular four-sided bottom 1 to the sides of which are hinged a front wall 2, a rear wall 3 and two side walls 4, 5. In the set-up condition of the body portion, FIGURE 2, the front, rear, and side walls are all retained in the erect condition thereof by infolded corner flaps 6 each of which is foldable about a score or crease

7 so that when the corner flaps are folded marginal portions 8 thereof overlie portions of the side walls of the body and are adhesively secured thereto by the application of pressure and of heat which softens the heat-sealable material 9, FIGURE 1, located therebetween. If desired, the rear wall may have a lid 10 hinged thereto, said lid having a front flap 13 and side flaps 11, 12 for ocnnection with the front 2 and sides 4, 5 of the body when the lid is in the closed condition thereof.

In one embodiment of the invention the inner surface of the blank is coated with a thermoplastic coating such as polyethylene. In another embodiment of the invention the opposite sides of the blank are gloss-waxed by the application thereto of a coating of low viscosity paraffin wax. In this form of blank there is provided beneath the wax coating, in the areas of the blank which are to be adhered one to another, a coating of thermoplastic adhesive composition 9 which is incompatible with the wax, is non-tacky at normal temperatures and is softened at a temperature higher than the melting temperature of the wax, and the softening temperature of the adhesive composition is preferably appreciably above the melting temperature of the wax, the difference being for example of the order of 20° C. One suitable form of thermoplastic adhesive composition is a polyvinyl acetate resin having incorporated therein plasticisers which render it heat-soluble but non-tacky at normal temperatures.

Referring to FIGURES 3 to 7, the blanks are contained in a flat condition in a magazine 14, FIGURES 4 and 5, from which they are removed one at a time by blank-feeding means comprising sucker elements 15 connectable in known manner, not shown, with a source of negative air pressure. The sucker elements 15 are supported by a carrier 16 which is rockable about the axis of a rock shaft 17 by a link 18, a connecting rod 19 and an operating arm 20 which is pivoted at 21 for operation by a cam 22 rotatable with a shaft 23 driven by bevel gears 24, 25, FIGURE 4, from a reduction gearing 26 which is driven by an electric motor 27.

Rocking of the sucker elements 15 from the broken line position thereof shown in FIGURE 5 causes a blank to be moved out of the magazine 14 and deposited on to a blank support 28 which comprises a waiting station for the blank until a die, described below, is moved into position to receive the blank. The blank is moved from the support 28 by transfer means which comprises feed fingers 29 mounted on a U-shaped carriage 30 provided with rollers 31 arranged to run in guide rails 32. The carriage 30 is reciprocated along the rails 32 by a link 33, a feed lever 34 pivoted at 35, and a crank 36 which is rotated by bevel wheels 37, 38 of which the wheel 37 is secured to shaft 23.

A plurality of dies, indicated generally by the reference D, are arranged in equi-spaced relation for simultaneous movement in one direction as indicated by the arrow 39, FIGURE 3. In the embodiment of the invention being described the dies are four in number and are mounted on a carrier 40, FIGURE 6, which is rotatable continuously about a vertical pillar 41 by a gear 42 which is secured to the carrier 40 and which meshes with a gear 43 driven from the gear box 26.

Each of the dies comprises four walls each secured to the carrier 40 and two of the walls, being the opposite side walls 44, 45, FIGURES 6 and 7, embody heater devices 46 located in those regions of the die in which the portions 8 are to be secured to the carton side walls 4, 5. The heater devices comprise electrical low voltage resistance heater housed in electrically insulated members 47 and are connected by wires 48 with electrical brushes 49 which co-operate with stationary input elements shown as slip rings 50 secured to the pillar 41. The slip rings

are connected, as illustrated in FIGURE 8, with a source of electrical potential 51 and the heater circuits include contactors 52 which are operated by switches 53 movable with the dies and operated by a stationary cam 54. By this arrangement the heater devices are switched on and off in controlled manner as described below.

As a carton blank is positioned over a die by the feed fingers 29 it is engaged by projections 55 carried by the die so that the blank is caused to move with the die. Each die is provided with a punch element 56 by which the blank is pressed into the die to effect the setting-up of the blank. The punch element is carried by a punch carrier 57 which is slidable axially of guides 58 under control of a stationary cam 59 secured to the pillar 41 and having a cam track 60 in which a roller 61 supported by the carrier 57 is arranged to run. The guides 58 are secured to the carrier 40 for movement therewith.

The punch element 56 is connected to the punch carrier 57 by pins 62, FIGURE 7, and is slidable axially of the pins against the action of springs 63 so that the punch element 56 is movable relative to the punch carrier in the direction of movement of the carrier towards and away from the die. Pressure pads 64 are movable with the punch element 56 and are provided with slots 65 which permit the pads, under control of springs, not shown, and pad actuating means, to be moved, following movement of the blank into the die to the full extent of the forming movement of the punch element, relative one to the other towards and away from the opposite side walls 44, 45 of the die thereby to apply pressure to the overlying side portions 4, 5 and 8 of a carton set-up in the die by the punch element 56.

The pad-actuating means comprises a wedge 66, loaded by a spring 67, supported by the punch carrier 57 for movement therewith and for movement lengthwise of the direction of movement of the punch carrier towards and away from the die thereby to move the pads towards the die walls 44, 45 and effect the application of pressure to carton parts 4, 5 and 8.

Ejector means are provided to remove a set-up carton from the die following the application of heat and pressure to the carton portions 4, 5 and 8 for a predetermined interval of time, and the ejector means comprises an ejector pad 68 carried by a stem 69 slidable axially in a housing 70 mounted on the carrier 40 for movement therewith. The ejector pad is urged towards the punch element 56 by a spring 71 so that as the punch element is raised to the retracted position thereof by the punch carrier 57 the ejector pad 68 follows the punch element and causes the set-up carton to be moved therewith out of the die. As the bottom of the carton leaves the die the upper edges of the carton body are engaged by a stripper element 72, FIGURE 6, which is movable with and located above the die, thus arresting movement of the set-up carton so that the continued upward movement of the punch element to the retracted position thereof causes the punch element to be withdrawn from the set-up carton.

As diagrammatically illustrated in FIGURE 3, a stationary guide 73 is interposed in the path of a set-up carton which has been ejected from the die and removed from the punch element and the guide 73 is arranged to guide the carton into a channel 74 for movement by a pusher member 75 away from the path of the dies. The pusher member 75 may be carried by a conveyor, not shown, which is operable from above the channel 74 and the guide 73 is provided with openings, not shown, which is operable from above the channel 74 and the guide 73 is provided with openings, not shown, which permit the free passage of the blank-engaging projections 55 provided on the dies.

The sequence of operation of the machine is indicated in FIGURE 3 from which it will be seen that a blank is positioned over a die and is engaged by the projections 55 at position 76. During the portion 77 of the movement of the die the blank is pressed into the die and set-up by the downward stroke of the punch element 56 and pressure is applied to the carton parts 4, 5 and 8 by the pressure pads 64. The switches 53 are closed at position 76 and the heater elements 46 are fully effective during the portion 78 of the movement of the die at the end of which the switches are again opened so that during the portion 79 of the movement of the die the carton is cooling. Ejection of the carton from the die and the stripping thereof from the punch element is effected during the portion 80 of the movement of the die. Thus it will be understood that full heating of the thermoplastic sealing composition 9 to cause sealing of the carton parts 4, 5 and 8 is effected only after the carton parts 4, 5 and 8 have been pressed together and a period of cooling is provided before the set-up carton is ejected from the die. It will also be understood that the pressure remains applied to the carton parts 4, 5 and 8 until the cooling has been effected and the punch element commences its return stroke to the retracted position thereof.

With some forms of carton blank material it may be more advantageous to apply heat to the inside of the set-up carton and in such instances the heater elements may be fitted to the punch element and the pressure pads provided in the die walls 44, 45.

By a machine as described herein it is possible to obtain a high rate of output of set-up cartons due to the arrangement of the plurality of dies which permits each set-up carton to be retained in a die for the requisite interval of time to ensure adequate adhesion of the sides 4, 5 to the infolded corner flaps 7, 8, but without the necessity of reducing the rate at which blanks can be fed from the magazine. Further, the set-up carton can, with a machine as described herein, be permitted to remain in a die for approximately one half of a revolution of the die carrier.

I claim:

1. A machine for setting-up a carton from a blank which includes body-forming sides to be secured in the set-up position thereof by the application of heat and pressure to overlying side-forming portions of the blank having a heat-sealable material therebetween and pre-applied to the blank, said machine comprising a plurality of equi-spaced dies and reciprocable four-sided punches appropriate thereto supported for simultaneous movement in one direction, each said die consisting of four walls between which a blank is set-up by a plunger, heater means embodied in each of a pair of opposed die walls to heat overlying side portions of a carton set-up in the die, pressure applying means movable with and relative to opposite sides of each punch to apply pressure to overlying side portions of a carton engaged by said pair of opposed die walls, blank-feeding means operable to feed blanks in succession to said dies, ejector means movable with each said die and relative thereto to remove a set-up carton from the die in the direction of the return movement of the punch appropriate thereto, and actuating means co-operating with said punches and ejector means to effect operation thereof in timed relation one with the other in a manner such that a punch is operable to press a blank into the die appropriate thereto and the ejector means for the die is operable to remove a set-up carton from the die after heat and pressure have been applied to the carton for a predetermined interval of time.

2. A machine for setting-up a carton from a blank which includes body-forming sides to be secured in the set-up position thereof by the application of heat and pressure to overlying side-forming portions of the blank having a heat-sealable material therebetween and pre-applied to the blank, said machine comprising a rotatable carrier, a plurality of equi-spaced dies supported by the carrier for movement therewith and each consisting of four walls, heater means embodied in each of a pair of opposed die walls to heat overlying side portions of a carton set-up in the die, blank-feeding means operable to

feed blanks in succession to said dies, a four-sided punch for each die, pressure applying means movable with and relative to opposite sides of each punch to apply pressure to overlying side portions of a carton engaged by said pair of opposed die walls, guides mounted on said carrier for movement therewith and supporting said punches for reciprocable movement into and out of the dies appropriated thereto, ejector means movable with each said die and relative thereto to remove a set-up carton from the die in the direction of return movement of the punch appropriate thereto, and actuating means co-operating with said punches and ejector means to effect operation thereof in timed relation one with the other in a manner such that a punch is operable to press a blank into the die appropriate thereto and the ejector means for the die is operable to remove a set-up carton from the die after heat and pressure have been applied to the carton for a predetermined interval of time.

3. A machine for setting-up a carton from a blank which includes body-forming sides to be secured in the set-up position thereof by the application of heat and pressure to overlying side-forming portions of the blank having a heat-sealable material therebetween and pre-applied to the blank, said machine comprising a continuously rotatable carrier, a plurality of equi-spaced dies supported by the carrier for movement therewith and each consisting of four walls, heater means embodied in each of a pair of opposed die walls to heat overlying side portions of a carton set-up in the die, blank-feeding means operable to feed blanks in succession to said dies, a four-sided punch for each die, pressure applying means movable with and relative to opposite sides of each punch to apply pressure to overlying side portions of a carton engaged by said pair of opposed die walls, guides mounted on said carrier for movement therewith and supporting said punches for reciprocable movement into and out of the dies appropriated thereto, ejector means movable with each said die and relative thereto to remove a set-up carton from the die in the direction of return movement of the punch appropriate thereto, and actuating means co-operating with said punches and ejector means to effect operation thereof in timed relation one with the other in a manner such that a punch is operable to press a blank into the die appropriate thereto and the ejector means for the die is operable to remove a set-up carton from the die after heat and pressure have been applied to the carton for a predetermined interval of time.

4. A machine for setting-up a carton from a blank which includes body-forming sides to be secured in the set-up position thereof by the application of heat and pressure to overlying side-forming portions of the blank having a heat-sealable material therebetween and pre-applied to the blank, said machine comprising a continuously rotatable carrier, a plurality of equi-spaced dies supported by the carrier for movement therewith and each consisting of four walls, heater means embodied in each of a pair of opposed die walls to heat overlying side portions of a carton set-up in the die, blank-feeding means operable to feed blanks in succession to said dies, a four-sided punch for each die, pressure applying means movable with and relative to opposite sides of each punch to apply pressure to overlying side portions of a carton engaged by said pair of opposed die walls, guides mounted on said carrier for movement therewith and supporting said punches for reciprocable movement into and out of the dies appropriated thereto, ejector means movable with each said die and relative thereto to remove a set-up carton from the die in the direction of return movement of the punch appropriate thereto, and actuating means co-operating with said punches and ejector means to effect operation thereof in timed relation one with the other in a manner such that a punch is operable to press a blank into the die appropriate thereto and the ejector means for the die is operable to remove a set-up carton from the die after heat and pressure have been applied to the carton

for a predetermined interval of time, said actuating means including a stationary cam concentric with the axis of rotation of the carrier and arranged to effect movement of the punches into and out of the dies and movement of said pressure applying means towards said pairs of opposed die walls.

5. A machine for setting-up a carton from a blank which includes body-forming sides to be secured in the set-up position thereof by the application of heat and pressure to overlying side-forming portions of the blank having a heat-sealable material therebetween and pre-applied to the blank, said machine comprising a continuously rotatable carrier, a plurality of equi-spaced dies supported by the carrier for movement therewith and each consisting of four walls, heater means embodied in each of a pair of opposed die walls to heat overlying side portions of a carton set-up in the die, a magazine to contain a stack of carton blanks, a blank support located between the magazine and the path of said dies, means to remove a blank from the magazine and to deposit it on said support, and transfer means operable in timed relation with the movement of the dies to transfer a blank from the support and to locate it over a die for setting-up therein, a four-sided punch for each die, pressure applying means movable with and relative to opposite sides of each punch to apply pressure to overlying side portions of a carton engaged by said pair of opposed die walls, guides mounted on said carrier for movement therewith and supporting said punches for reciprocable movement into and out of the dies appropriated thereto, ejector means movable with each said die and relative thereto to remove a set-up carton from the die in the direction of return movement of the punch appropriate thereto, and actuating means co-operating with said punches and ejector means to effect operation thereof in timed relation one with the other in a manner such that a punch is operable to press a blank into the die appropriate thereto and the ejector means for the die is operable to remove a set-up carton from the die after heat and pressure have been applied to the carton for a predetermined interval of time.

6. A machine according to claim 2, wherein the ejector means comprises a spring-loaded ejector pad movable with the die appropriate thereto and relative to the die in the direction of movement of the punch thereby to be movable with and by the punch, and a stripper element movable with and located above the die to strip a set-up carton from the punch during movement of the punch to the retracted position thereof.

7. A machine according to claim 6, including a stationary guide interposed in the path of set-up cartons removed from punches by said stripper elements and arranged to guide the cartons away from the path of the dies.

8. A machine according to claim 2, wherein the heater means comprise electric resistance heaters embodied in said opposed walls of each die, said heaters being electrically connected with brushes movable with the dies and co-operating with stationary input rings, and including cam-operated switches operable to energise the heaters for a predetermined interval following the application to the overlying side portions of the set-up carton by said pressure-applying means.

9. A machine for setting-up a carton from a blank which includes body-forming sides to be secured in the set-up position thereof by the application of heat and pressure to overlying side-forming portions of the blank having a heat-sealable material therebetween and pre-applied to the blank, said machine comprising a continuously rotatable carrier, a plurality of equi-spaced dies supported by the carrier for movement therewith and each consisting of four walls, heater means embodied in each of a pair of opposed die walls to heat overlying side portions of a carton set-up in the die, blank-feeding means operable to feed blanks in succession to said dies, a four-sided punch for each die, each said punch including a punch element supported for movement into and out of

the die therefor by a punch carrier and for movement relative to the punch carrier in the direction of movement of the punch carrier, pressure pads movable with the punch element and relative one to the other towards and away from said opposed walls of the die, and pad-actuating means operable following movement of a blank by the punch element into the die to the full extent of the forming movement of the punch element to move the pads towards said opposed walls of the die thereby to apply pressure to overlying side portions of the blank set-up in the die by the punch element, guides mounted on said rotatable carrier for movement therewith and supporting said punch carriers for reciprocable movement towards and away from the dies appropriate thereto, ejector means movable with and relative thereto each said die to remove a set-up carton from the die in the direction of return movement of the punch element appropriate thereto, and actuating means co-operating with said punches and ejector means to effect operation thereof in timed relation one with the other in a manner such that a punch is operable to press a blank into the die appropriate thereto and the ejector means for the die is operable to remove a set-up carton from the die after heat and pressure have been applied to the carton for a predetermined interval of time.

10. A machine for setting-up a carton from a blank which includes body-forming sides to be secured in the set-up position thereof by the application of heat and pressure to overlying side-forming portions of the blank having a heat-sealable material therebetween and pre-applied to the blank, said machine comprising a continuously rotatable carrier, a plurality of equi-spaced dies supported by the carrier for movement therewith and each consisting of four walls, heater means embodied in each of a pair of opposed die walls to heat overlying side portions of a carton set-up in the die, blank-feeding means operable to feed blanks in succession to said dies, a four-sided punch for each die, each said punch including a punch element supported for movement into and out of the die therefor by a punch carrier and for movement relative to the punch carrier in the direction of movement of the punch carrier, pressure pads movable with the punch element and relative one to the other towards and away from said opposed walls of the die, and pad-actuating means operable following movement of a blank by the punch element into the die to the full extent of the forming movement of the punch element to move the pads towards said opposed walls of the die thereby to apply pressure to overlying side portions of the blank set-up in the die by the punch element, guides mounted on said rotatable carrier for movement therewith and supporting said punch carriers for reciprocable movement towards and away from the dies appropriate thereto, ejector means movable with and relative to each said die to remove a set-up carton from the die in the direction of return movement of the punch element appropriate thereto, and actuating means co-operating with said punches and ejector means to effect operation thereof in timed relation one with the other in a manner such that a punch is operable to press a blank into the die appropriate thereto and the ejector means for the die is operable to remove a set-up carton from the die after heat and pressure have been applied to the carton for a predetermined interval of time, said actuating means including a stationary cam concentric with the axis of rotation of the carrier and arranged to effect movement of the punches into and out of the dies and movement of said pressure pads towards said pairs of opposed die walls.

11. A machine according to claim 10, wherein the ejector means comprises a spring-loaded ejector pad movable with the die appropriate thereto and relative to the die in the direction of movement of the punch thereby to be movable with and by the punch, and a stripper element movable with and located above the die to strip a set-up carton from the punch during movement of the punch to the retracted position thereof.

12. A machine according to claim 11, including a stationary guide interposed in the path of set-up cartons removed from punches by said stripper elements and arranged to guide the cartons away from the path of the dies.

13. A machine according to claim 10, wherein the blank-feeding means comprises a magazine to contain a stack of carton blanks, a blank support located between the magazine and the path of said dies, means to remove a blank from the magazine and to deposit it on said support, and transfer means operable in timed relation with the movement of the dies to transfer a blank from the support and to locate it over a die for setting-up therein.

14. A machine according to claim 10, wherein the pad-actuating means comprises a spring-loaded wedge supported by each punch carrier for movement therewith and for lengthwise movement relative thereto in the direction of movement of the punch carrier towards and away from the die associated therewith thereby to move the pads towards said opposite walls of the die and to effect the application of said pressure.

15. A machine according to claim 10, wherein the heater means comprise electric resistance heaters electrically connected with brushes movable with the dies and co-operating with stationary input rings, and including cam-operated switches operable to energise the heaters for a predetermined interval following the application of pressure to overlying side portions of the set-up carton by the pressure pads.

References Cited in the file of this patent

UNITED STATES PATENTS

2,600,954	Bardet	June 17, 1952
2,829,569	Aquilla	Apr. 8, 1958
2,843,027	Sevison	July 15, 1958