March 30, 1954 L. S. FLEISCHER ET AL 2,673,430

WRAPPING AND PACKAGING MACHINE

Filed June 18, 1949 4 Sheets-Sheet 1

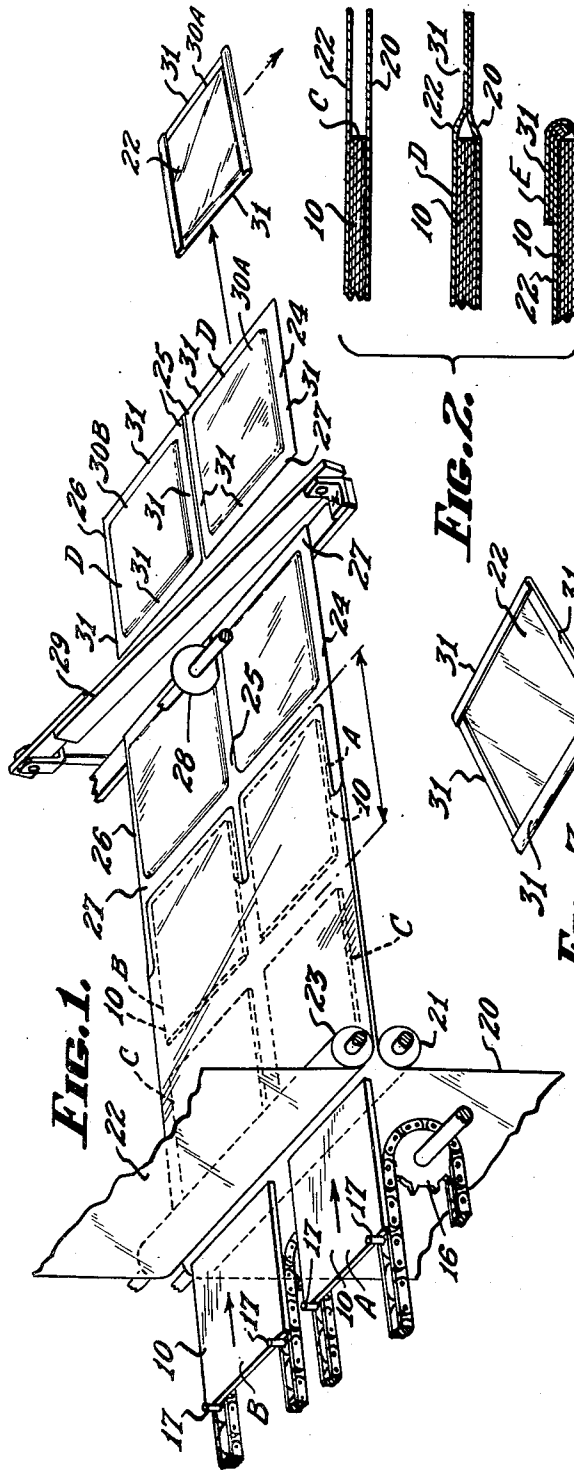

FIG. 1.

FIG. 2.

FIG. 3.

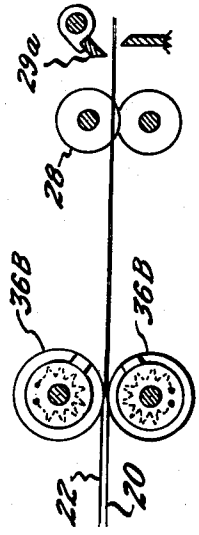

FIG. 13.

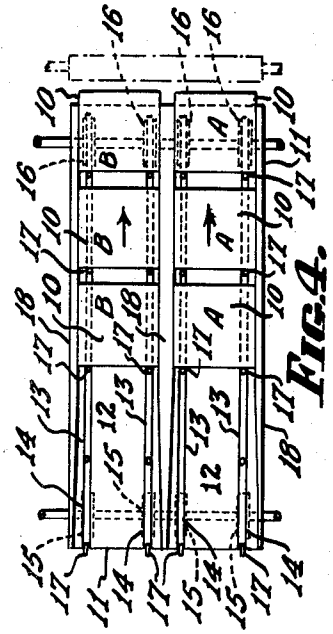

FIG. 4.

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WRAPPING AND PACKAGING MACHINE

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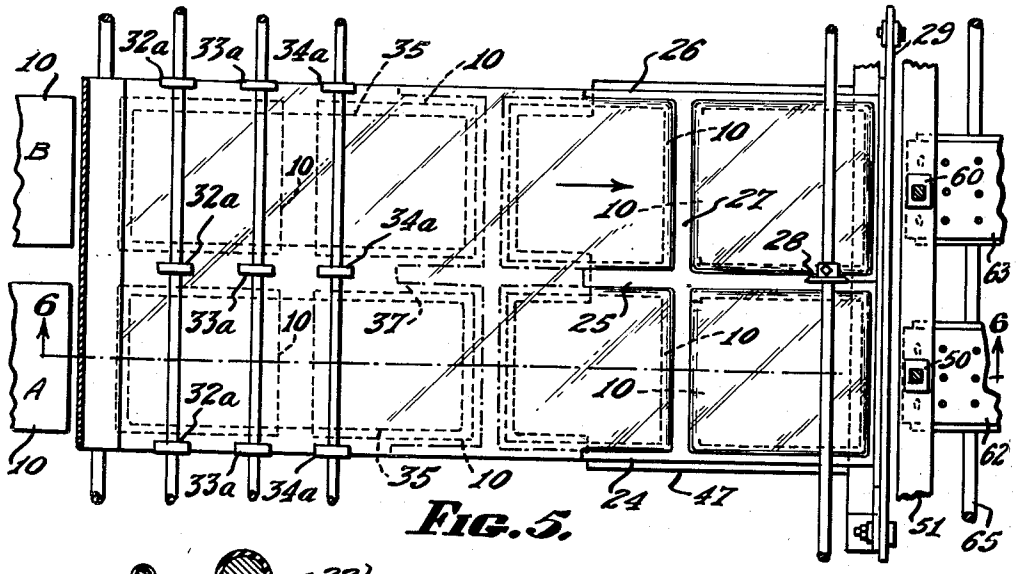

FIG. 5.

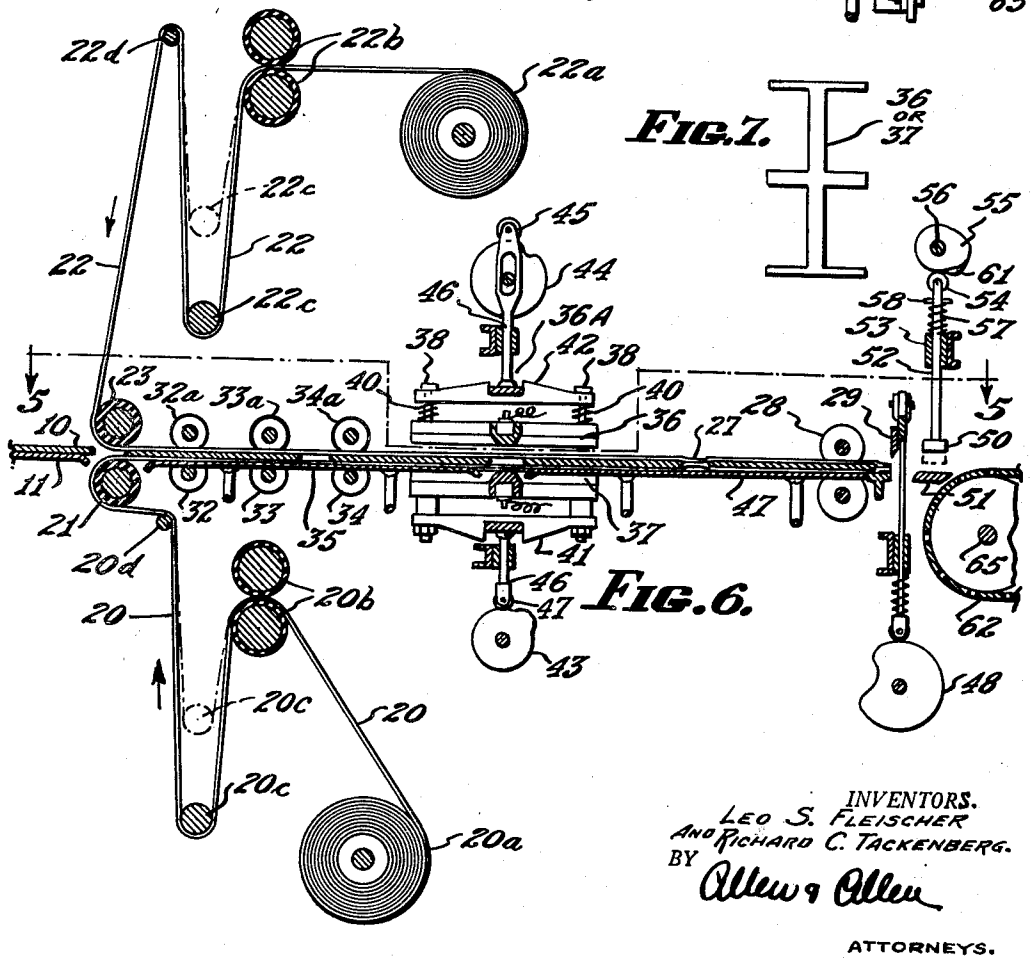

FIG. 6.

FIG. 7.

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WRAPPING AND PACKAGING MACHINE

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4 Sheets-Sheet 3

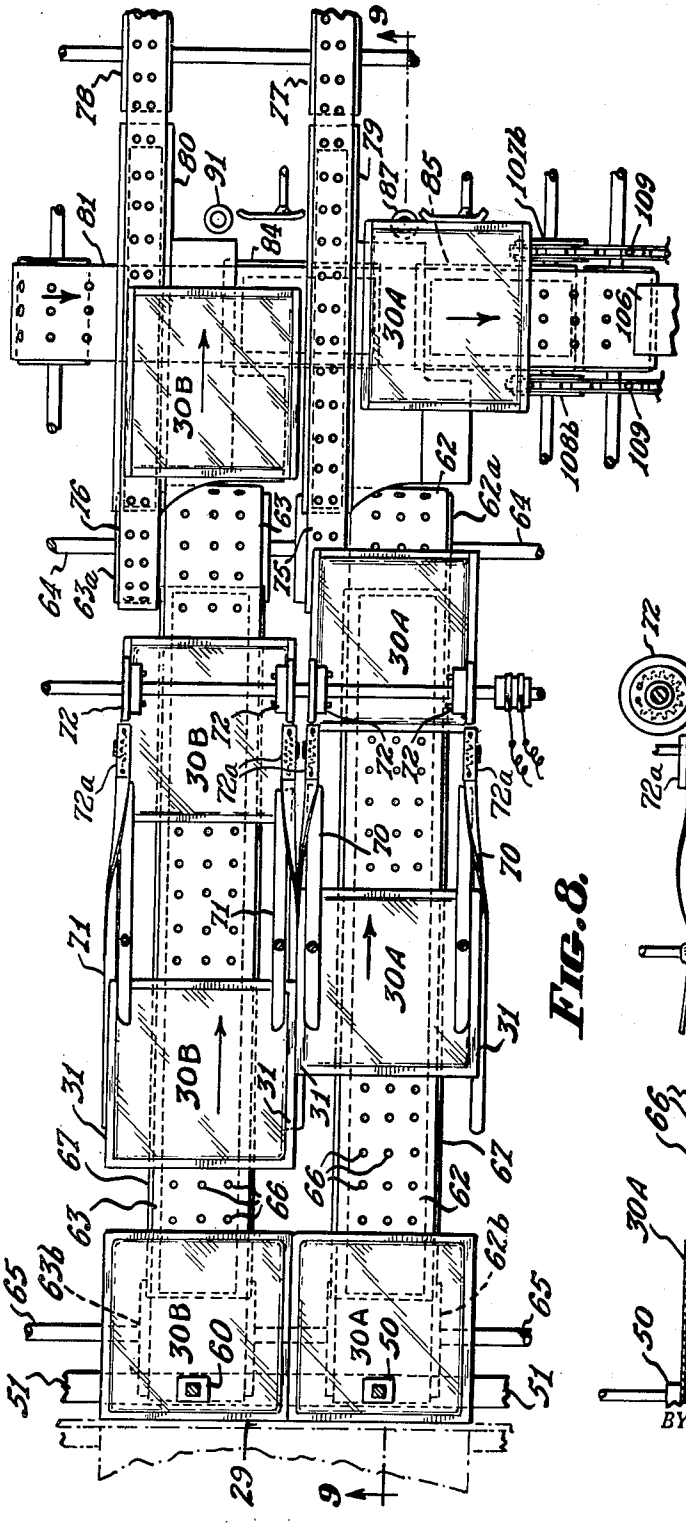

FIG. 8.

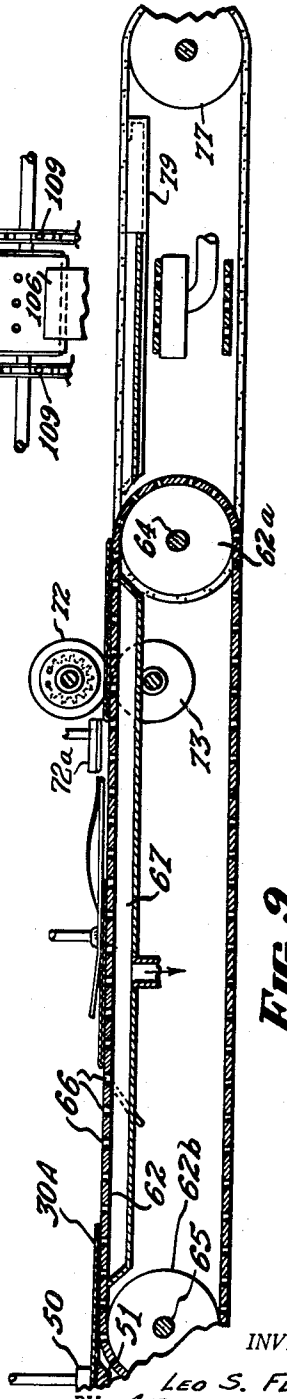

FIG. 9.

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WRAPPING AND PACKAGING MACHINE

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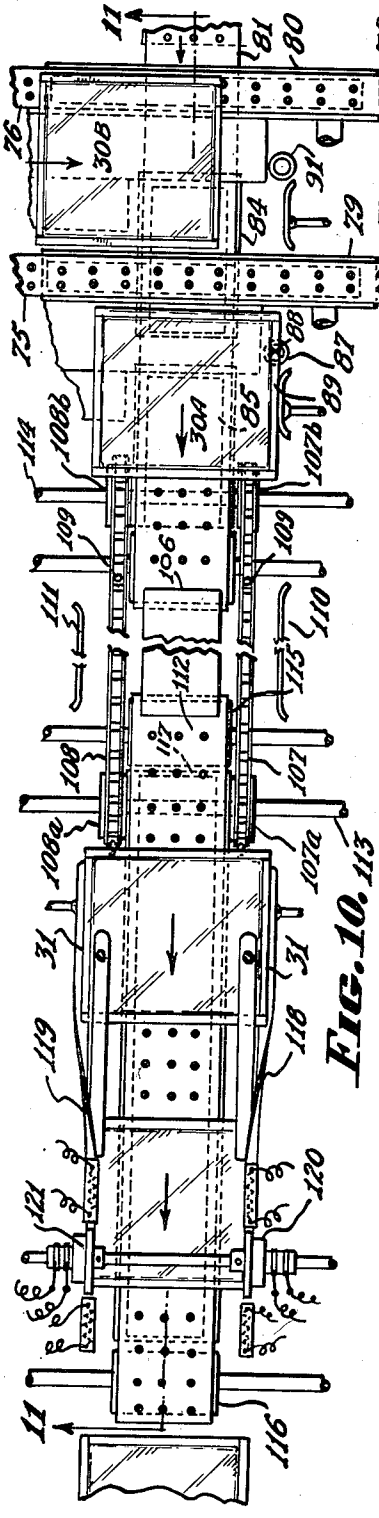

FIG. 10.

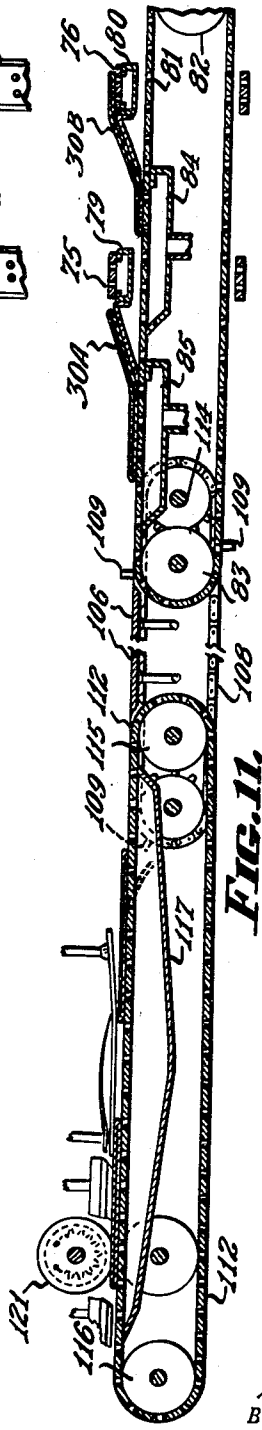

FIG. 11.

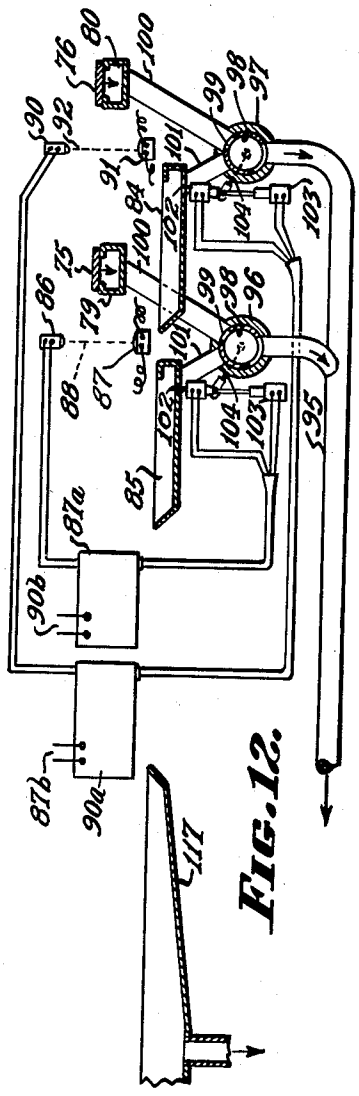

FIG. 12.

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2,673,430

WRAPPING AND PACKAGING MACHINE

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Application June 18, 1949, Serial No. 99,898

2 Claims. (Cl. 53—84)

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Our invention relates to machines for the wrapping and packaging of flat articles wherein the articles to be wrapped have sufficient resistance to compression as to withstand the pressure of compression members which the machine employs.

It is the object of our invention to provide a machine for wrapping articles with plastic film material or wax paper or other heat sealable wrapping material wherein two sheets of the wrapping film are fed from rolls, along in conjunction with the articles, one film above the article feed, and the other below, and the articles are enclosed as to their tops and bottoms with sheets of the wrapping film wherein the edges of the film overlap at the sides and ends. The overlapped side and end edges are subsequently folded over forming a single folded, doubly heat sealed edge band surrounding the periphery and laid against one surface of the package.

It is our object to provide a machine for wrapping flat articles wherein a substantially impervious sealed joint is provided.

Another object is to provide a wrapping or packaging machine wherein during the enclosing of the article the article proceeds in a single predetermined plane of movement normally horizontal. Such mechanism obviates the necessity of additional mechanical devices for moving and supporting the articles incorporated in most wrapping machines which operate on the principle of the articles picking up the wrappers and then being mechanically maneuvered in a sequence of operations in various planes of movement from which the articles emerge in wrapped condition.

Another object is the provision of a machine for wrapping articles wherein the wrapper may be removed without the necessity of a tear string, since flaps at each of the four corners provide means for securing a grasp with the fingers for removing the wrapper. Such construction further provides, with one side edge torn off, a bag or envelope which may be utilized for further packaging of other articles.

The foregoing objects and other objects to be hereinafter described or claimed, we accomplish by that certain combination and arrangement of parts of which we have illustrated a preferred embodiment.

Referring to the drawings, which are semi-diagrammatic:

Figure 1 is a fragmentary perspective view illustrating certain initial steps in the packaging process.

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Figure 2 embraces a series of enlarged sectional views showing certain progressive steps in formation of a package.

Figure 3 illustrates a completed package as produced by our machine.

Figure 4 is a plan view showing one arrangement of a feed table which may be employed.

Figure 5 is a plan view taken on the line 5—5 of Figure 6 and showing initial steps of the packaging operation.

Figure 6 is a vertical sectional view taken on the line 6—6 of Figure 5.

Figure 7 is a plan view of a heated sealing member, being on a reduced scale.

Figure 8 is a plan view showing further steps in the packaging process, the figure being a continuation of Figure 5.

Figure 9 is a vertical sectional view taken on the line 9—9 of Figure 8.

Figure 10 is a plan view showing the final steps in the packaging process, this figure being a continuation of Figure 8.

Figure 11 is a vertical sectional view taken on the line 11—11 of Figure 10.

Figure 12 is a diagrammatic view illustrating electronically controlled means employed for transferring the work pieces from an initial conveyor to a second conveyor arranged at a right angle to the initial conveyor, and

Figure 13 is a diagrammatic view illustrating certain alternative mechanism which may be employed for making the feed continuous instead of intermittent.

Throughout the drawings the work pieces, items or articles to be packaged are indicated at 10. For the purpose of this specification a work piece or article may be considered a sheaf of decorative wrapping paper or the like approximately 10 inches square and $\frac{1}{16}$ inch in thickness. It will be understood, however, that our invention may be readily adapted to packaging of various other articles of thin proportion, the only essential requirement of which is that the packages will not crush under compression operations of the machine.

Referring first to Figure 4, a feed table or loading station, generally indicated at 11, comprises a smooth table surface 12 having slots 13. Chains 14, arranged beneath the table surface and running over sprockets 15 at the left and 16 at the right, carry pins 17 which extend up through the slots 13 and serve to convey the work pieces 10 to the right as indicated. There are two rows of work pieces arranged to enter the machine. It will be a simple mechanical equivalent to wrap

more than two advancing lines of articles by duplicating the number of units. Thus two or more lines of articles or work pieces may be wrapped. Thus in Figure 4 the feed table is constructed to accommodate one row of the work pieces marked A and another row marked B. The work pieces are delivered to starting position on the table, to be engaged and conveyed in the direction indicated by action of the pins 17. No mechanical delivery of the individual work pieces to the table starting positions are shown but may readily be incorporated. For purposes of explanation of the machine illustrated, we may consider that the individual units, comprising folded sheets of paper to be wrapped, are fed to the machine manually by an operator who takes one or more units from a stack and places them in starting position.

As they are thus carried forward, the work pieces 10 are brought into proper alignment by suitable side guides 18.

Referring now to Figure 1, a web of cellophane or other heat sealable material 20 passes upward and over a roll 21. A web of similar material 22 moves downward and under a roll 23. After passing about the rolls 21 and 23, the webs are drawn forward in the same direction of movement as that of the work pieces by draw rolls, not shown in Figure 1, but later to be described. Thus the work pieces moving forward from the feed table are pinched between the rolls 21 and 23, and are carried forward at a slightly increased rate over that of the feed pins 17. The work pieces become interposed between the lower web 20 and the upper web 22. It will be observed from examination of the drawings that the work pieces are positioned in interspaced relation with each other, thus leaving marginal areas of the webs 20 and 22 which areas will be joined together by heat sealing as later described. The interposed relation of the work pieces between the webs is indicated at C in Figures 1 and 2.

With the work pieces thus interposed between the webs the assembly is carried forward to a heat sealing mechanism, not shown in Figure 1, but later to be described, which seals together the marginal areas of the webs producing longitudinal lines of seal 24, 25, and 26, in combination with transverse lines of seal 27. These sealed marginal portions form pockets confining the work pieces 10 between the webs and producing a waffle like structure with each of the work pieces contained within a pocketed formation thereof.

As the structure thus formed moves forward a rotary knife or slitter 28 is arranged to sever the cellophane on the center line of the longitudinal sealed margin 25. A stationary slitter may be used to accomplish this same purpose. A shear 29 is suitably disposed and actuated to sever the cellophane on the center line of the transverse sealed marginal portions 27. The webs of cellophane with the work pieces sealed between are thus cut into individual packages such as indicated at 30A and 30B, each package containing one of the work pieces 10 sealed between an upper and a lower piece of the cellophane. This stage of the packaging process is indicated at D and referring briefly to Figure 2 it may here be pointed out that the sealed marginal portions 31 form what will be referred to as "fins" on the four sides of the package.

Referring now to Figures 5 and 6, the webs of cellophane 20 and 22 are respectively withdrawn from supply rolls 20*a* and 22*a* by means of suitable pairs of draw rolls 20*b* and 22*b*, which rolls are driven at a constant speed slightly faster than the material is being used. Since the feed in the machine is intermittent, the dance roll 20*c*, 22*c* takes up the slack. At intervals the operator stops the feed of the rolls 20*b*, 22*b*, to permit the slack to be taken up. After passing between these initial draw rolls the webs pass under floating or dance rolls 20*c* and 22*c*, from which rolls they pass up and over guide rolls 20*d* and 22*d* onto the draw rolls 21 and 23 previously mentioned. The dance rolls keep constant tension on the web. The rolls 21 and 23 will, of course, be driven in timed relation with the feed of the web through the machine.

Upon emerging from the rolls 21 and 23 the forward travel of the webs with the work pieces interposed therebetween is assisted by a series of guide rollers 32, 33, which rolls are driven and respectively have cooperating upper rolls 32*a*, 33*a*. The clearance between the rolls 32, 32*a* and 33, 33*a* is such that the cellophane webs will not be pulled too tightly as to prevent sufficient slack for the side edge overlaps. The pinch rolls, 34, 34*a* actually help feed the webs forward. As clearly seen in Figure 5 these rolls are narrow and are arranged to grip the webs in the longitudinal marginal portions existing between the interspaced work pieces 10. Suitable supporting surfaces such as the plates 35, will of course, be provided beneath the web 20.

Upon leaving the rolls 34 and 34*a* the webs pass into sealing mechanism generally indicated at 36A in Figure 6. The sealing mechanism here shown comprises upper and lower electrically heated sealing members 36 and 37, both having the configuration shown in Figure 7. As best seen in Figure 6, the upper of these members is resiliently mounted by means of pins 38 and springs 40 in a suitable supporting member 42. The lower member 37 is not spring mounted and with each operation is elevated to the level of the center of the work package. The members 41 and 42 are in turn slidably mounted and actuated by cams 43 and 44, which cams, acting through rollers 45 and rods 46, urge the sealing members 36 and 37 toward each other to engage and seal together the cellophane webs in the said marginal areas existing between the work pieces 10 as previously described. As the webs move forward toward the shear 29, they will be supported by a suitable plate 47.

It may be pointed out that use of a sealing device of the type just described requires that the forward movement of the webs and work pieces shall be intermittent, the movement pausing during the sealing operation. Thus the driving means for the feed table 11 and the various draw rolls engaging the webs may be arranged to function intermittently. The required lineal movement of the webs, which occurs during each cycle of operation, will equal the overall length of cellophane required for one package, and the pause between movements shall be sufficient to permit operation of the sealing device. For this purpose the cams 43 and 44 are driven in timed relation and designed to actuate the sealing device during the pauses between movements. The transverse shear 29 is likewise actuated during the intervals of pause by means of a cam 48. The rotary slitter 28, as shown is driven in conformance with movement of the webs.

It will be readily apparent to those skilled in the art that the required intermittent movement of the webs as herein described may be replaced by a continuous movement. As shown in Figure 13

this may be accomplished by substitution of a rotary type sealing device 36B for sealing the marginal portions and employing a rotary or fly knife 29a for severing the transverse marginal portions 27. It will be observed that after the first heat sealing and cutting off the movement of the packages is continuous irrespective of whether up to this stage the movement is continuous or intermittent. In the case of a single machine wrapping one line of moving articles or work pieces a continuous feed may be more desirable.

Referring briefly to Figures 8 and 9 the packages 30A, these packages comprising work pieces or articles surrounded by cellophane, sealed and then severed from the webs by shear 29, are gripped between a retarding or holding finger 50 and a lower bar 51. As seen in Figure 6 the finger 50 is fixed on a rod 52 slidably mounted in a suitable guide 53. The rod has a roller or cam follower 54 urged against a cam 55 which is mounted on a shaft 56 driven in timed relation. A compression spring 57 bears against a pin 58 fixed in the rod 52 to urge the slidable parts to the position shown.

A similar retarding finger 60 is provided and arranged to grip the packages 30B. This finger is actuated by a cam 61 also mounted on the shaft 56. The cams 55 and 61 are so designed that the fingers 50 and 60 descend together and grip the packages just as they are cut off by action of the shear 24.

While the packages 30A and 30B are thus held by the fingers 50 and 60, their leading ends rest upon continuously running suction belts 62 and 63 which belts tend to carry the packages forward. The cam 55 is arranged to release the packages 30A before the packages 30B are released by action of the cam 61. This results in positioning the packages 30A ahead of the packages 30B in their forward direction of travel for purpose of facilitating a right angle change in the direction of travel as will presently be clear.

Referring now to Figures 8 and 9 the suction belts 62 and 63 are respectively driven by pulleys 62a and 63a mounted on the shaft 64, the belts also running over pulleys 62b and 63b mounted on a shaft 65. The belts are, of course, perforated as indicated at 66 and have suitable suction chambers 67 underlying their forward direction of travel. These suction chambers are, of course, connected to a suitable suction pump or the like (not shown).

Thus the packages 30A and 30B are carried forward respectively by the belts 62 and 63. As well known in the art suitable folding bars 70, for the packages 30A and 71 for the packages 30B, are arranged to engage and fold inwardly the previously sealed marginal portions or fins 31, which are disposed parallel to the direction of travel. This folded position of the fins is indicated at E in Figure 2 and as the packages move onward the folded portions just mentioned are engaged between heated sealing rollers 72 and cooperating lower rollers 73. Heat sealing plates 72a may be used to supplement the heat sealing roller 72. The result of the operation is to seal the fins onto the upper piece of cellophane 22 resulting in permanently securing the fins 31 in the position indicated at E in Figure 2. The packages 30A and 30B are carried forward from the sealing rolls by action of the vacuum belts 62 and 63.

The pulleys 62a and 63a, previously mentioned, are arranged to also drive narrow belts 75 and 76,

which belts are also of the suction type and are arranged to engage relatively narrow portions of the packages 30A and 30B while conveying them forward.

Still referring to Figures 8 and 9, belts 75 and 76 also run over pulleys 77 and 78. In their forward direction of travel these narrow belts respectively have suction chambers 79 and 80, each of which is normally active and is connected through a valve to the suction source as will presently be described.

As shown in Figure 10, a wider suction belt 81 is arranged to pass beneath the belts 75 and 76, its direction of travel being at a right angle to the travel of the belts and the packages as thus far described. This belt 81 runs continuously and traverses over pulleys 82 and 83. It is also provided with two relatively short suction chambers 84 and 85, each of which is normally inactive, being temporarily disconnected from the suction source.

Associated with the narrow belt 75 which conveys the packages 30A is a photoelectric cell 86 provided with a light source 87 which emits a light beam 88. This light beam lies in the path of travel of the packages 30A as most clearly shown in Figure 10.

As the packages 30A approach the position of that one indicated at 89, they are held to the belt 75 by the suction provided through the chamber 79. But the belt 75 engages and supports only a relatively narrow portion at one side of the package and as the package is somewhat flexible its unsupported portion bends downwardly and rests upon the belt 81 above the suction chamber 85 which chamber is normally inactive, being disconnected with the source of suction by means of a valve, presently to be disclosed.

As each package 30A arrives at the position indicated at 89, the light beam 88 will be broken causing the photoelectric cell 86 to activate other mechanism presently to be described, which cuts off the suction from the normally active chamber 79, switches it to the normally inactive chamber 85. This results in releasing the packages 30A from the narrow belt 75 and transferring them onto the belt 81, upon which belt the package will be conveyed forward in its new direction of travel.

The packages 30B conveyed by belt 76 are similarly transferred onto the belt 81 by means of a photoelectric cell 90, having a light source 91 which emits a beam 92, to control mechanism presently described which switches the suction from chamber 80 and diverts it to the chamber 84.

Referring now to Figure 12 the photoelectric cells 86 and 90 respectively control apparatus within cabinets 87a and 90a supplied by electrical circuits 87b and 90b. Each of the cabinets contains electronic apparatus which controls a pair of solenoids 102 and 103 as will later be described.

The suction chambers 79 and 85 are selectively connected to a suction line 95 by means of a valve 96. Likewise the suction chambers 80 and 84 are selectively connected with suction line 95 by a valve 97. As shown the movable members of the valves comprise hollow cores 98, each of which is connected with the suction source and has a port 99 adapted to apply the suction to the tube 100 when the core is in the position shown. When moved to its alternate position (not shown) the port 99 will divert the suction from the tube 100 and apply it to the tube 101.

The positions of the hollow cores 98 and consequently the application of suction flowing therethrough is controlled by means of solenoids 102 and 103, the plungers of which are connected to lever arms 104 fixed to the hollow cores. The cores will be moved to the position shown when the solenoids 102 are energized. Likewise the cores will be moved to their alternate positions when the solenoids 103 are energized.

As each package is carried forward by the belt 81 it passes onto a plate 106 upon which plate the package may momentarily come to rest. A pair of chains 107 and 108 have pins 109 which next engage the package to convey it forward between side guides 110 and 111, thus assuring proper alignment of each package as it is carried forward onto a suction belt 112. The chains 107 and 108 are driven by sprockets 107a and 108a fixed on shaft 113 and operate over other sprockets 107b and 108b fixed on shaft 114.

The suction belt 112 extends between pulleys 115 and 116 and has a suction chamber 117 underlying its forward direction of travel. As the packages are carried forward on this belt a pair of folding bars 118 and 119 engage the fins 31 disposed parallel to the direction of travel, to fold them inwardly to a position against the upper surface of cellophane 22 as also again illustrated at E in Figure 2.

The final operation of sealing is effected by suitable heated sealing rolls 120 and 121. These rolls serve to seal the fins 31 onto the upper surface of the wrapping material 22 and the package, thus completed, falls from the belt 112 to any suitable receiving device.

As produced by the mechanism described, the finished package appears as shown in Figure 3, the fins 31 on all four sides having been turned inwardly and sealed onto the upper surface of cellophane 22 as most clearly indicated at E in Figure 2, the heat seal being a double heat seal with a single fold.

We are aware that machines for wrapping articles such as pills, small discs and the like have been developed in which a plastic film is fed along and the small articles are spaced in position on the web and that subsequently a top web is applied which is heat sealed to the bottom web supporting the small articles, but so far as we are advised, the principle of advancing webs one above and one below an article to be wrapped, the article being supported in separate means between the two, is a novel approach to the packaging of articles having substantial dimensions as to length and width.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A wrapping machine provided with mechanism for feeding webs of wrapping material above and below a horizontal plane of movement of plural rows of articles to be wrapped, means for heat sealing the webs together along lines spaced from front, back and side edges of the articles, means for cutting the combined webs through a seal into a number of bands equal to the number of plural rows of articles, means for cutting the front and back edges of the material through a seal in overlapped position from the front and back edges of the article, and means for folding over and heat sealing the overlapped edge portions of wrapping material against the surface of the upper web as the articles move continuously along, said last mentioned means comprising means for first folding over and heat sealing the sealed overlapped side edges of the webs and a right angle cross feed conveyor provided with means for folding over and heat sealing the front and back sealed overlapped edges of the webs along the plural rows of articles in interspaced sequence.

2. A wrapping machine provided with mechanism for feeding webs of wrapping material above and below a horizontal plane of movement of plural rows of articles to be wrapped, means for heat sealing the webs together along lines spaced from front, back and side edges of the articles, means for cutting the combined webs through a seal into a number of bands equal to the number of plural rows of articles, means for cutting the front and back edges of the material through a seal in overlapped position from the front and back edges of the article, and means for folding over and heat sealing the overlapped edge portions of wrapping material against the surface of the upper web as the articles move continuously along, said last mentioned means comprising means for first folding over and heat sealing the said overlapped side edges of the webs and a right angle cross feed conveyor provided with means for folding over and heat sealing the front and back sealed overlapped edges of the webs along the plural rows of articles in interspaced sequence, both of said conveyors being of the vacuum type and comprising perforated belts passing over troughs in which there may be maintained a vacuum, means associated with said troughs for producing a vacuum therein, said vacuum means normally producing a vacuum only in that trough associated with said first conveyor, and photoelectric cells effected by the feed of the wrapped articles whereby said vacuum means is switched from operative connection with the trough of said first conveyor to the trough of said cross feed conveyor.

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