June 28, 1966 P. CARTIER ETAL 3,257,915

BAG FORMING MACHINE

Filed July 10, 1963 6 Sheets-Sheet 1

FIG. 1

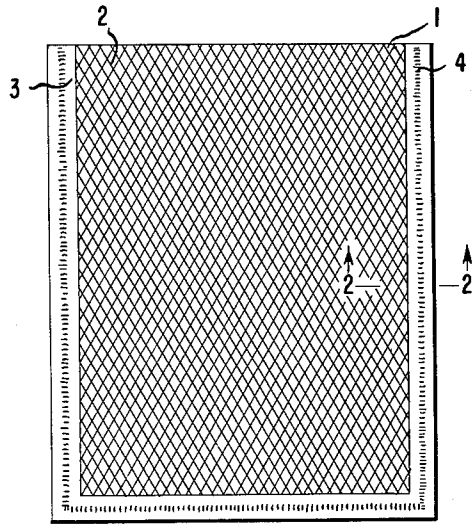


FIG. 2

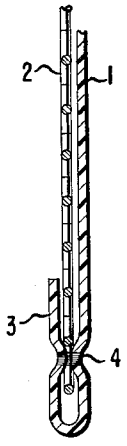
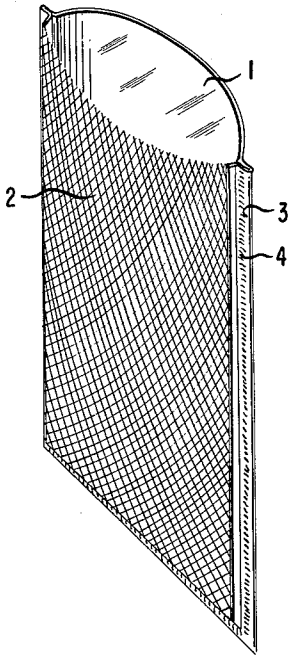


FIG. 3



INVENTORS
PIERRE CARTIER
LOUIS ST. ARNAUD

BY A. Robert Snyder

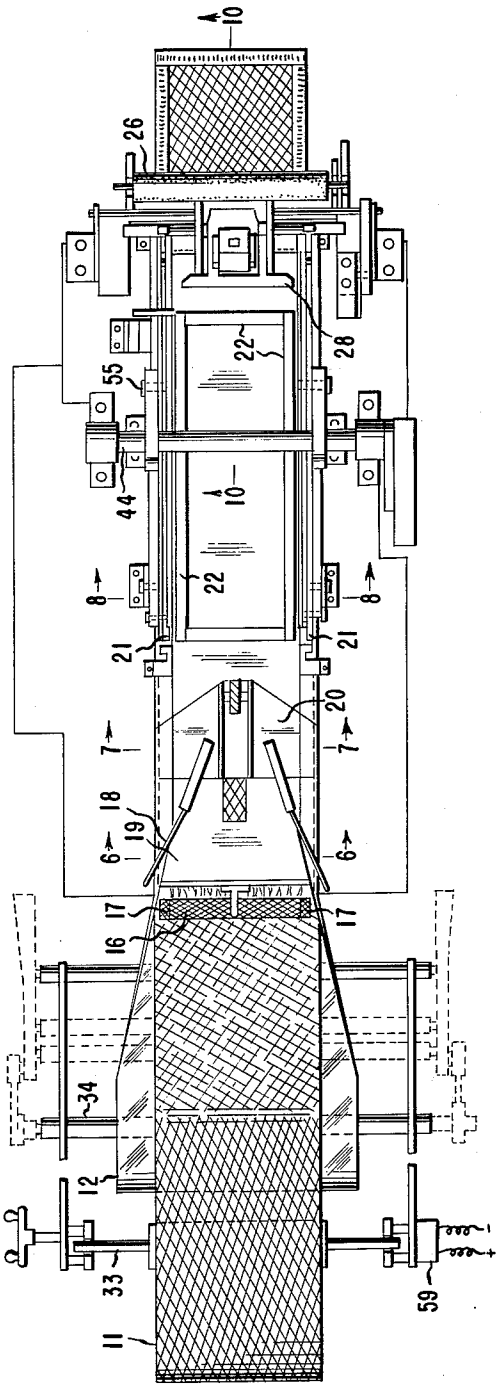
ATTORNEY

June 28, 1966 P. CARTIER ETAL 3,257,915

BAG FORMING MACHINE

Filed July 10, 1963 6 Sheets-Sheet 2

FIG. 4



INVENTORS
PIERRE CARTIER
LOUIS ST. ARNAUD

BY G. Ralph Snyder

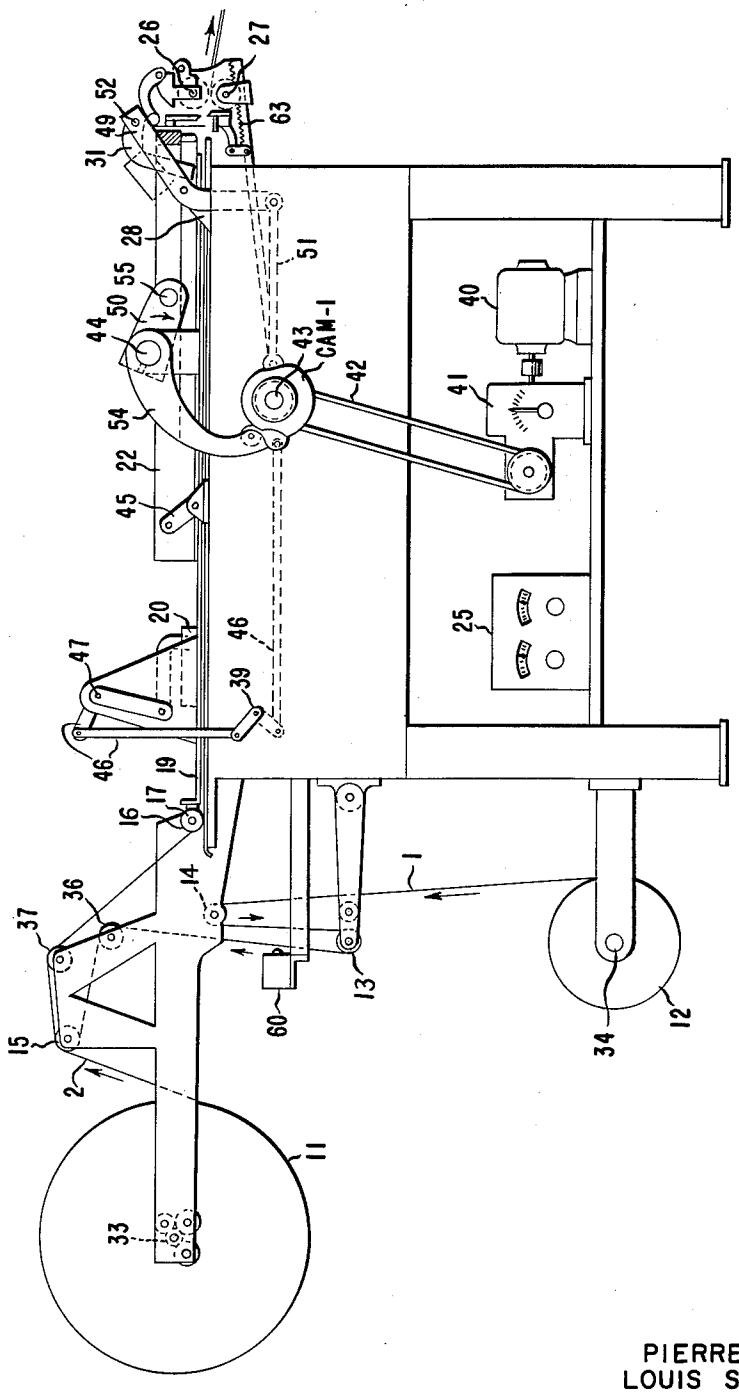
ATTORNEY

June 28, 1966 P. CARTIER ETAL 3,257,915

BAG FORMING MACHINE

Filed July 10, 1963 6 Sheets-Sheet 3

FIG. 5



INVENTORS
PIERRE CARTIER
LOUIS ST. ARNAUD

BY C. Ralph Snyder.

ATTORNEY

June 28, 1966 P. CARTIER ETAL 3,257,915

BAG FORMING MACHINE

Filed July 10, 1963 6 Sheets-Sheet 4

FIG. 6

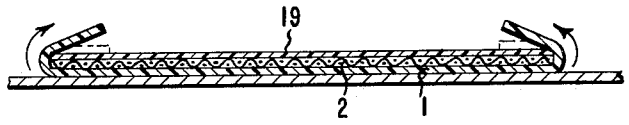


FIG. 7

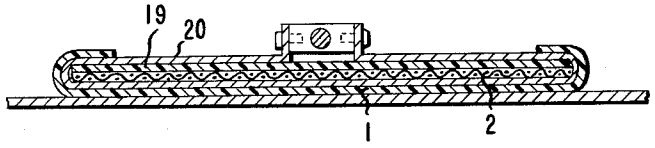
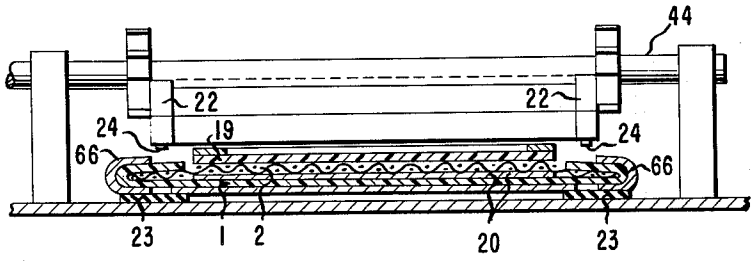


FIG. 8



INVENTORS
PIERRE CARTIER
LOUIS ST. ARNAUD

BY A. Robert Snyder

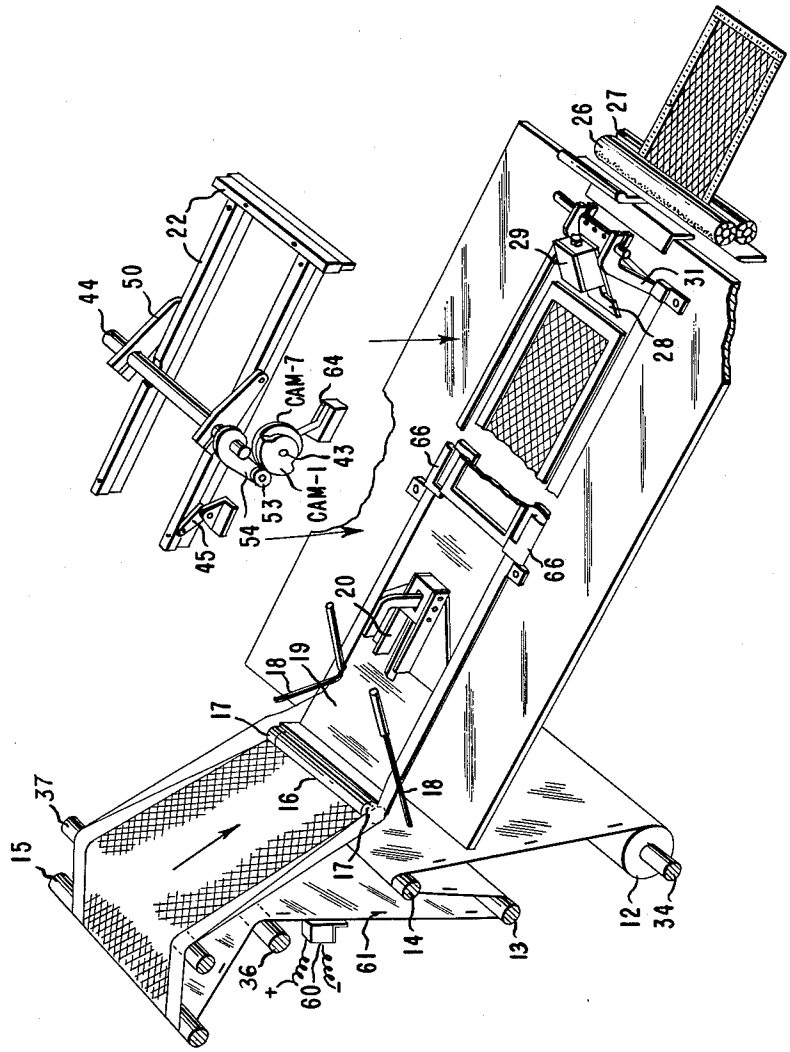
ATTORNEY

June 28, 1966 P. CARTIER ETAL 3,257,915

BAG FORMING MACHINE

Filed July 10, 1963 6 Sheets-Sheet 5

FIG. 9



INVENTORS
PIERRE CARTIER
LOUIS ST. ARNAUD

BY C. Robert Snyder.

ATTORNEY

June 28, 1966 P. CARTIER ETAL 3,257,915

BAG FORMING MACHINE

Filed July 10, 1963 6 Sheets-Sheet 6

FIG. 10

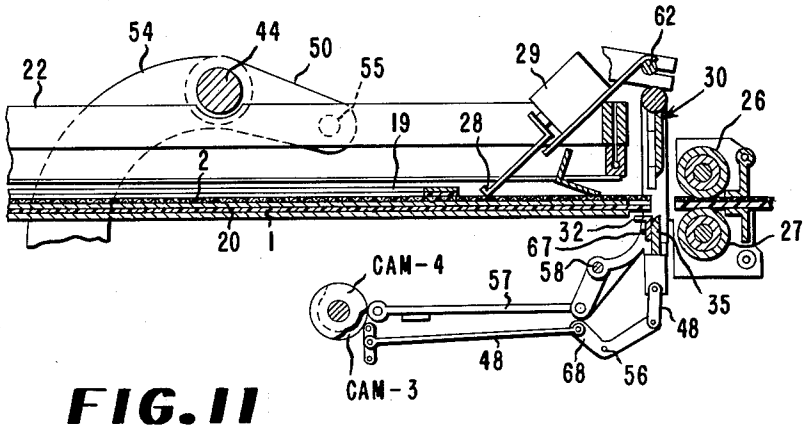


FIG. 11

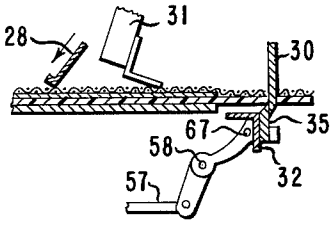


FIG. 12

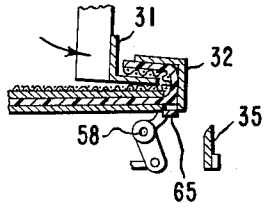
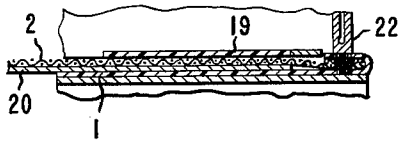


FIG. 13



INVENTORS
PIERRE CARTIER
LOUIS ST. ARNAUD

BY

ATTORNEY

United States Patent Office 3,257,915
Patented June 28, 1966

1

3,257,915

BAG FORMING MACHINE

Pierre Cartier, 10852 St. Urbain St., and Louis St. Arnaud, 9225 Waverley St., both of Montreal, Quebec, Canada

Filed July 10, 1963, Ser. No. 294,002
Claims priority, application Canada, July 10, 1962, 853,438
5 Claims. (Cl. 93—8)

This invention relates to bagging machines, in particular to a bagging machine for manufacturing bags from a combination of thermoplastic net and thermoplastic film.

There has been recently introduced into the market a new type of bag intended primarily for use in packaging farm produce. This bag, described in United States Patent application Serial No. 196,276, filed May 21, 1962 to T. A. Day, now United States Patent No. 3,123,279, has a number of unique features. It is a flat type bag having two faces sealed together on three sides. One of these faces or surfaces is made of thermoplastic net and the other face of thermoplastic film.

Such a bag has a number of advantages. The film surface provides a large area which can be printed upon for identification purposes. This, of course, can also prevent light from striking the product and causing deterioration. The other side of the bag made of thermoplastic net permits adequate ventilation of the product and allows close inspection of the product through the interstices of the net. The resultant bag is attractive in appearance and quite strong, as the film provides considerable reinforcement for the net at the sealed edges.

One drawback to this style of bag has been the difficulties which have been encountered in manufacturing it. The thermoplastic netting which is a major component of the bag is extremely susceptible to dimensional change through applied stress. Even moderate tension in the length direction of the bag can, for example, cause a narrowing of the web which seriously hampers the bag making operation. Any deformation of the netting during manufacture will cause a concentration of stresses at the seals joining the netting to the film. This will result in weak points in the completed bag. In addition, after the bag has been formed, the netting tends to return to its original dimensions, pulling the film and the completed bag out of shape and presenting an awkward, ugly appearance.

None of the bag making machines now available can handle these materials in combination to give an acceptable product. This is quite understandable for thermoplastic netting is still a comparatively new material and not too widely used at the present time.

An object, therefore of this invention is to provide a method of manufacturing a bag having one face thermoplastic film and another face thermoplastic netting.

Another object of this invention is to provide a method of manufacturing such a bag having substantially no tension or stress in the netting during the manufacturing process.

A further object of this invention is to provide a machine for continuously making such bags requiring only a roll of film and a roll of netting at one end and producing finished bags at the other end.

Yet another object of this invention is to provide a novel means of folding the film and netting over on itself and holding said film and netting in place for sealing to form the bottom of the bag.

Additional objects and teachings of the invention will become apparent from the more detailed description given

2

below, it being understood that such more detailed description is given by way of illustration and explanation only and not by way of limitation since various changes therein may be made by those skilled in the art without departing from the scope or spirit of the present invention.

In connection with that more detailed description;

FIGURE 1 is a plan view of the bag produced by this machine;

FIGURE 2 is a cross-section of the bag in FIGURE 1 along line 2—2;

FIGURE 3 is an isometric view of the completed bag;

FIGURE 4 is a plan view of the bag forming machine;

FIGURE 5 is a side elevation of the complete bag forming machine;

FIGURE 6 is a cross-section of the apparatus in FIGURE 4 on the line 6—6;

FIGURE 7 is a cross-section of the apparatus in FIGURE 4 on the line 7—7;

FIGURE 8 is a cross-section of the apparatus in FIGURE 4 on the line 8—8;

FIGURE 9 is an exploded isometric view of the top section of the machine and superimposed upon this is an isometric view of the sealing mechanism;

FIGURE 10 is a cross-section of the apparatus in FIGURE 4 on the line 10—10;

FIGURE 11 is a detail showing the tucker and foldover mechanism prior to movement;

FIGURE 12 is a detail showing the tucker and bottom foldover mechanism with their folding movement completed;

FIGURE 13 is a detail at the bottom of the bag showing the reciprocating plate retracted.

Referring now to the drawings, FIGURE 1 shows a plan view of the bag showing the seals on three sides and the open mouth. FIGURE 2 shows the film material 1 folded over the edge of the bag to form a flap 3 of film in front of the netting 2 and the seal 4 joining the film to itself through the interstices of the net. FIGURE 3 shows an isometric view of the bag and gives an overall idea of its appearance.

In the operation of the machine a roll of film 12 is mounted on its supply mandrel 34 as shown in FIGURES 4 and 5. A roll of net 11 is mounted on its supply mandrel 33 with its associated brake 59. The film 1 is run vertical up over idler roll 14 and under dancer roll 13 which maintains a constant tension on the film. After leaving the dancer roll the film passes over idler roll 36 and at roll 15 is brought into surface contact with the net 2. The film 1 is under the net, and together these two materials pass over idler roll 37 and under rolls 16 and 17 to pass over the bed of the bag making machine. With the web of the netting superimposed on the film, the film acts as a supporting belt, carrying the netting forward with very little stress being applied to the net.

The superimposed layers of film and netting pass under the segmented rolls 16 and 17. The central grooved portion of this roll 16 tends to flatten or spread the two webs before they enter the subsequent folding operation. The edges of the roll 17 which are mounted to turn independently permit the edge of the lower film web to turn upward in a partial folding action over the narrower web of netting. This partial foldover is further developed by guide rods 18 shown in FIGURE 9 such that the film is in a form which will ultimately enfold each edge of the netting.

A guide plate 19 under which the two superimposed webs must pass as shown in FIGURE 6 serves several

purposes. It holds the web in a flattened form and provides an edge against which the film is folded by the guide rods **18**, to the width desired in the finished bag. This guide plate which is stationary extends the length of the machine and terminates just before an electrically operated hinge plate **28** to be described later. The location of the guide plate **19** is shown in FIGURE 6 with the netting and film under it and, as will be seen in FIGURE 7, the film is folded over the top of the guide plate and thus over the netting.

In the thread-up of the machine, the two webs which have been in contact up to this point are separated such that the film passes under and the net on top of a reciprocating plate **20** as shown in FIGURE 7. As the film moves along the machine, a former **66** engages the edges of the two webs and retains the film in its folded over position on top of the edges of the netting. This illustrated in FIGURES 8 and 9.

The stationary guide plate **19**, the reciprocating plate **20** and former **66** are cut away in appropriate areas to form longitudinal slots for the entry of vertically moving heat-seal bars **22**. Up to this point the film edge folds have been separated from contact with the netting and the lower film web by the presence of the stationary guide plate **19** and reciprocating plate **20**. Upon reaching the cut-away areas, however, these edge folds can be pressed into firm contact with the webs underneath by a downward movement of the heat sealing bars **22** as is illustrated in FIGURE 8.

A resilient cushion **23** formed from material such as silicone rubber backs up the web layers in the region of the slot and provides a pad against which the sealing bars can be pressed.

An electrical impulse is passed through a metallic resistant bar **24** mounted on the sealer jaws **22**. These, when brought into contact with the film and the netting, result in a temperature increase sufficient to weld these materials together. Three bars have been mounted in a common assembly to allow simultaneous sealing of the two edge folds and a cross fold which forms the bottom of the finished bag. More or less heat can be applied as desired through manipulation of controls mounted in panel **25**.

Impulse sealers have been used in our work, however, other heat sealing methods such as continuously heated sealing bars, ultra sonic or radio frequency sealing devices, travelling heated bands and such like can be used. It is of course necessary to control the temperature of the heat sealing source to give the exact amount of heat required and to apply sufficient pressure to seal the film through the netting to itself.

Upon completion of the heat sealing operation the sealing bars are raised and the reciprocating plate **20** positioned between the two web layers is moved towards the discharge end of the machine by the action of a mechanical linkage connected to the machine drive. This is illustrated in FIGURES 5, 10 and 13. In this movement the end of the plate abuts against the cross seal joining the two webs and pushes this seal ahead of it into the nip formed by a pair of nip rolls **26** and **27**. At this point, with the webs held securely by the nip rolls, the reciprocating plate **20** reverses direction and moves back to its original position.

By suitable mechanical connection the nip rolls are now turned a predetermined amount to give the desired length of the bag. In so doing, the heat sealed webs held by these rolls are pulled along the machine thus positioning another length of netting and film beneath the heat seal bars for the next cycle. To stop the travel of the webs at the predetermined length, the nip rolls **26** and **27** are momentarily separated and the rotation of the rolls is stopped. It has been found that more accurate results can be obtained by releasing the pressure on the nip rolls first and then stopping their rotation later. Releasing the grip of the rolls on the webs, of course, permits a relaxation of any stresses which were introduced through the pulling action. This relaxation is assisted by hinged plate **28** positioned in contact with the netting which exerts a slight pushing action from a solenoid **29**. As is shown in FIGURE 10 the hinged plate **28** is pivoted on shaft **62** and when solenoid **29** is actuated the plate **28** is moved downward pressing against the netting and film and since it is pivoted at shaft **62**, rides on the netting, moving in a direction away from the nip rolls **26** and **27**. This movement assists in the relaxation of the webs and allows this relaxation to take place rapidly thus permitting the machine to be operated at a faster rate. In addition the hinged plate **28** remains pressed against the top of the netting until after the sealing operation, keeping the film and netting flat.

A shear knife **30** now descends severing the two web layers against the lower stationary blade **35** and is then retracted. This is shown in FIGURES 10 and 11. The nip rolls close and turn a sufficient amount to deliver the severed completed bag to a stacking chute (not shown).

In almost simultaneous timing with the descent of the shear knife, a tucker blade assembly **31** swings downward in an arcuate path towards the severed end of the webs. At the same time a bottom foldover bar **32** moves upward from its position of rest beneath the webs and through an upward and forward motion folds the severed tab end of the webs back on top of the tucker blade. When the fold is fully formed, the tucker blade is retracted leaving the folded web held in place by a pinching action of the foldover bar supplemented by the hinged plate **28** which by contact with the netting prevents any undue slippage away from the foldover bar. The solenoid **29** raises the hinged plate **28** out of contact with the webs prior to delivery of the next heat sealed length to the nip rolls.

The arc which the tucker blade follows is of interest since as will be seen in FIGURES 11 and 12 when it is being retracted there is a tendency for the tucker blade to pull the folded netting away with it. This netting is of course quite flexible and can be moved quite readily. Therefore, the position of the tucker blade is slightly tilted when in its full down position and when it is retracted it actually swings upward and away from the bottom of the netting thus preventing any friction or rubbing on the netting which would cause the netting to move away from the fold.

With the severed end now folded and held in position by the foldover bar and the webs lying in a flat relaxed state, the heat sealing-assembly is lowered for another cycle. As the heat seal assembly descends the bottom foldover bar **32** is closely timed to release the folded web just ahead of the heat sealing assembly and retract to its rest position. This permits the cross seal bar to engage the folded web freely and to form all seals at the same time.

Upon completion of sealing, the heat seal assembly is raised and the reciprocating plate **20** moves to push the sealed length into the nip rolls thus completing the cycle.

Studying the overall machine in more detail, it is seen that all mechanisms on the machine are driven by one A.C. electric motor **40** which drives a variable speed drive **41** connected by a V-belt **42** to a cam shaft **43**. All eight cams associated with various mechanisms are mounted on this cam shaft.

Cam **1** shown in FIGURE 5 operates the sealing mechanism. As will be seen a follower **53** rides on cam **1** causing arm **54** to rotate shaft **44** which in turn swings arm **50** connected to shaft **44** on the sealer bars causing them to be raised or lowered. A rocker arm **45** at the front end of the sealer bar brings about an unusual motion and results in the back end of the sealer bar being higher, when raised, than the front and thus simplifying the overall operation of the machine.

Cam **2** (not shown) is also mounted on common cam shaft **43**. This cam operates the mechanism wihch produces movement in reciprocating plate **20** as is illustrated

in FIGURE 5. A series of push rods **46** and levers pivoted about points **39** and **47** transmit the desired forward and backward motion to the reciprocating plate.

Cam **3** governs the motion of the cutting knife illustrated in FIGURE 10. As will be seen push rods **48** and a lever **68** pivoted about shaft **56** transfer the motion of the cam into a vertical up and down movement of the knife **30** which cuts against the stationary blade **35** as is illustrated in FIGURE 11.

Cam **4** illustrated in FIGURE 10 is associated with the bottom foldover mechanism **32**. A slight movement of push rod **57** causes the bottom foldover mechanism **32** to pivot about shaft **58**. The foldover bar itself is pivoted at point **67** and during the last part of its swing about shaft **58** the bottom of the foldover bar **32** contacts a cam plate **65**, shown in FIGURE 12, which causes the foldover bar to pivot about point **67**, resulting in a forward movement of the top of the foldover bar and retaining the correct orientation of the mechanism.

Cam **5** (not shown) associated with the tucker mechanism **31** is illustrated in FIGURE 5. Push rod **51** operates to move lever **49** mounted on shaft **52**, the resultant rotation of this shaft causes the necessary movement of the tucker arm **31**. As was mentioned before, the position and arc made by this tucker arm are of utmost importance. Any arc which will cause the tucker blade to touch the netting on retraction will cause the netting to move back from the folded position and result in a deformed bag.

Cam **6** (not shown) operates the mechanism which raises and lowers the nip roll **26** when bags are being produced from film which has not been printed upon.

Cam **7** as shown in FIGURE 9 is also used to raise and lower the nip rolls but only when bags are being produced from printed material, the difference being that cam **7**, instead of operating a direct mechanical linkage as does cam **6**, operates a micro-switch **64** which resets the electric eye **60**. This electric eye mounted at the front end of the machine detects printing **61** on the film which indicates a bag length. The electric eye thus keeps the knife in phase with the printed matter on the bag and ensures that the cut will be made between the printed matter and not in the middle of said matter. As a result, when the electric eye detects one of these end marks **61**, the knife **30** is lowered to cut a bag. The micro-switch **64** operated by cam **7** is used to reset the electric eye so that it will operate again when a second such mark appears on the film.

Cam **8** (not shown) operates a micro-switch which energizes solenoid **29** which controls the motion of the hinged relaxer plate **28**.

An adjustable crank (not shown) is also mounted on common cam shaft **43**. This crank controls the rotation of the bottom nip roll **27**. A rack **63** illustrated in FIGURE 5 is connected to this adjustable crank and through suitable gears transmits motion to the nip roll. A one-way clutch on the nip roll allows motion only in the discharge direction and on the return stroke, although the rack is still in contact with the nip roll drive gears, no motion is transmitted.

The use of a plurality of cams makes this machine very flexible in its operation, since by substituting a cam or by rotating it on the common cam shaft **43** relative to the other cams, different timing of the machine components is possible.

This flexibility is illustrated in the manner in which the length of a bag can be altered. The sealed bag is pulled through the machine by the nip rolls rotated by an adjustable crank on cam shaft **43**. The timing of the start of the pulling is determined by the position of the crank. The length of the bag is set by the time of pulling which is stopped by separating the nip rolls brought about by cams **6** or **7**. Thus, to change the length of the bag produced on the machine it is not necessary to accurately set the length of the arm on the adjustable crank or to have a cam of the correct configuration, but simply to rotate the cam on the crang shaft relative to the adjustable crank.

The machine of this invention can be used to form bags from netting and film made from a wide range of materials.

An illustrative list of film materials would include polyolefins such as polyethylene, both low and high density, polypropylene and blends or copolymers of these materials with other materials such as polybutene, polyisobutylene and with each other. Various other heat sealable materials such as nylon and vinyl type films are also suitable. Materials which are not readily heat sealable in themselves such as polyester or cellulose films can of course be used if surface coated with a heat sealable material. Cellulose or cellulose acetate films coated with nitrocellulose, vinyl type materials or extrusion coated with polyethylene can be used.

Most thermoplastic materials are suitable for use as the netting component of the bag. As is discussed above the netting material need not be heat sealable. In addition the netting can be a fibrous material such as paper or cotton.

We claim:

1. A method for manufacturing bags successively from a web of heat sealable film and a narrower web of net-like material comprising feeding a web of said film with a web of said net-like material superimposed upon it under a flat guide plate whereby both of said webs are maintained in flattened form, folding the side edges of said film over on top of the two side edges of said netting and about the side edges of said guide plate, releasing substantially all applied stresses to said webs and permitting said webs to relax and return to their original dimensions, folding the ends of said webs over on top of themselves, joining the three edges of said webs by heat sealing the folded-over film to itself through the interstices of the net, inserting said webs into the conveying means, conveying said sealed section through the machine and cutting off said sealed section from the webs of film and netting, and discharging the completed bag from the machine.

2. A method for manufacturing bags successively from a web of heat sealable film and a narrower web of net-like material comprising feeding a web of said film with a web of said net-like material superimposed upon it under a flat guide plate whereby both of said webs are maintained in flattened form, folding the side edges of said film over on top of the two side edges of said netting and about the side edges of said guide plate, releasing substantially all lateral and longitudinal applied forces on said webs, applying a force to said webbing in the direction away from the conveying means to assist in releasing all stresses and permitting said webs to relax and return to their original dimensions, folding the ends of said webs over on top of themselves, joining the three edges of said webs by heat sealing the folded over film to itself through the interstices of the net, inserting said webs into the conveying means, conveying said sealed section through the machine and cutting off said sealed section from the webs of film and netting, and discharging the completed bag from the machine.

3. A method for manufacturing bags as claimed in claim **2** in which the netting is a thermoplastic heat sealable material and is heat sealed to the film.

4. A method for manufacturing bags as claimed in claim **2** in which the netting is a fibrous material.

5. Apparatus adapted for manufacturing bags successively from a web of heat sealable film and a narrower web of net-like material comprising, in combination, means for superimposing a web of net-like material on a wider web of heat sealable film, a guide plate, conveying means for pulling said superimposed webs under said guide plate, means for folding the side edges of the film over the side edges of said guide plate, pusher means to reduce the pulling stresses in the webs, means to fold the end edges of the webs over on top of themselves,

means to seal the three folded over edges, and cutting means to separate sealed bags from the webs.

References Cited by the Examiner

UNITED STATES PATENTS

2,056,804	10/1936	Potdevin	229—53
2,330,446	9/1943	Piazze et al.	93—18
2,442,936	6/1948	Rohdin	93—35
2,779,256	1/1957	Keller et al.	93—20
2,805,700	9/1957	Klasimg et al.	93—30 XR
2,873,566	2/1959	Sylvester et al.	93—35 XR
3,040,966	6/1962	Crane	229—53

BERNARD STICKNEY, *Primary Examiner.*