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Schmechel

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[54] **DEVICE FOR WRAPPING VERTICALLY PILED COINS OR THE LIKE IN BAGS MANUFACTURING OUT OF A SHRINK FILM**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **53/52,** 53/183, 53/184, 53/385

[51] **Int. Cl... B65b 43/04,** B65b 43/36, B65b 57/02

[58] **Field of Search** ..... 53/76, 180, 183, 184 S, 53/187, 191, 212, 254, 384, 385, 159, 52

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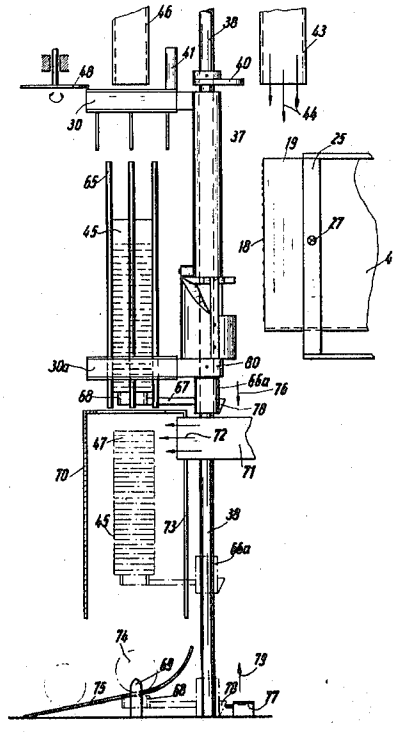
Primary Examiner—Robert L. Spruill

Attorney, Agent, or Firm—McGlew and Tuttle

[57] **ABSTRACT**

A method of wrapping uniformly shaped flat pieces, such as coins, piled up in columns, in a shrink film covering, comprises the operational steps of feeding a film band longitudinally folded in half and with the fold being below and the height of the folded band corresponding approximately to the height of the pile of pieces to be wrapped, intermittently heat-sealing and/or perforating the folded film band along vertical lines at distances corresponding to the diameter of the pile of pieces to be wrapped so as to form individual bags, consecutively blowing up each bag to open it, introducing into the open bag a bundle of pins adapted to be spread apart so as to hold the bag fast and open, tearing the bag off along the perforation to separate it from the remaining bags, transporting the open bag under the prepared pile, dropping the pile in vertical position into the bag, slowly lowering the bag containing the pile still in vertical position while it is subjected to a current of hot air to cause the film to shrink and to tightly engage the pile. The device for carrying out the method includes bag forming means in the form of heat-sealing and perforating equipment to form the bag side closures. Each bag is opened by a blower and is engaged after opening by a bag spreading and transporting mechanism. The opened bags are transported by the spreading and transporting mechanism to a location below a vertical stack of the articles and a selected quantity of the articles is dropped into each opened bag in succession. The filled bags are moved by means of a lowering mechanism through a heating chamber to cause the bag film material to tightly engage the articles while they are held in a vertical orientation.

12 Claims, 19 Drawing Figures



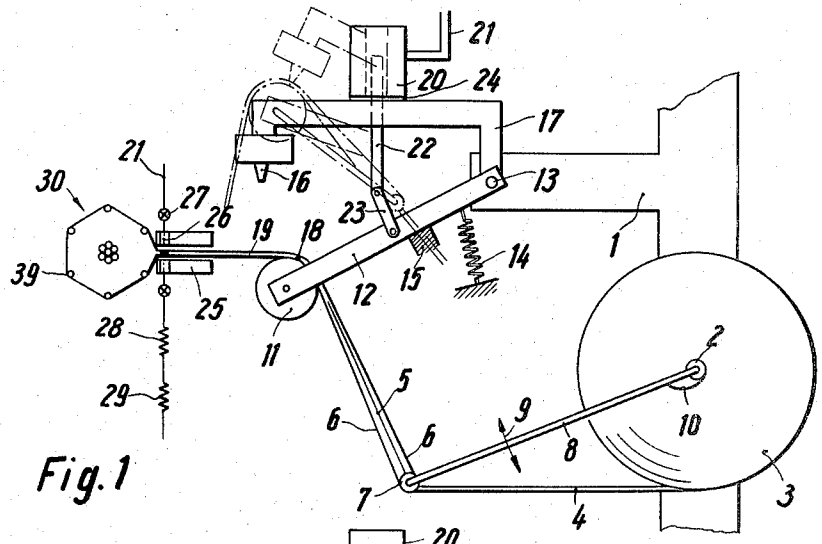


Fig. 1

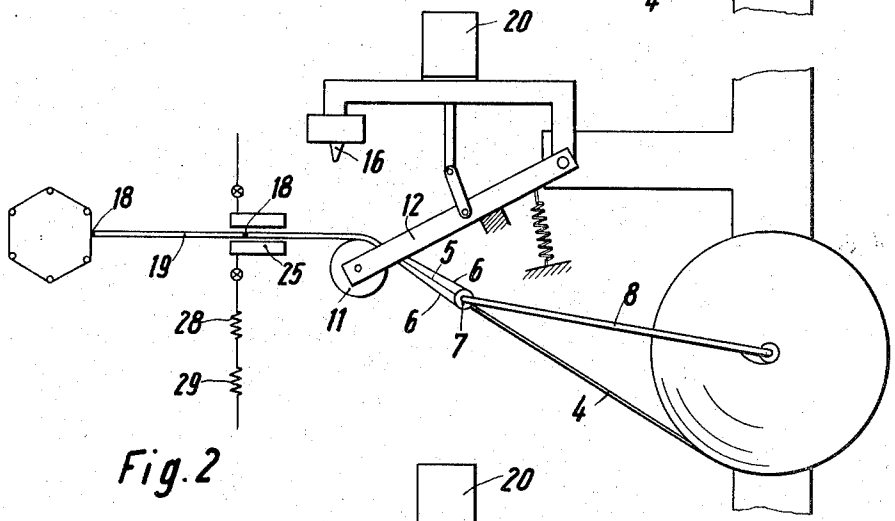


Fig. 2

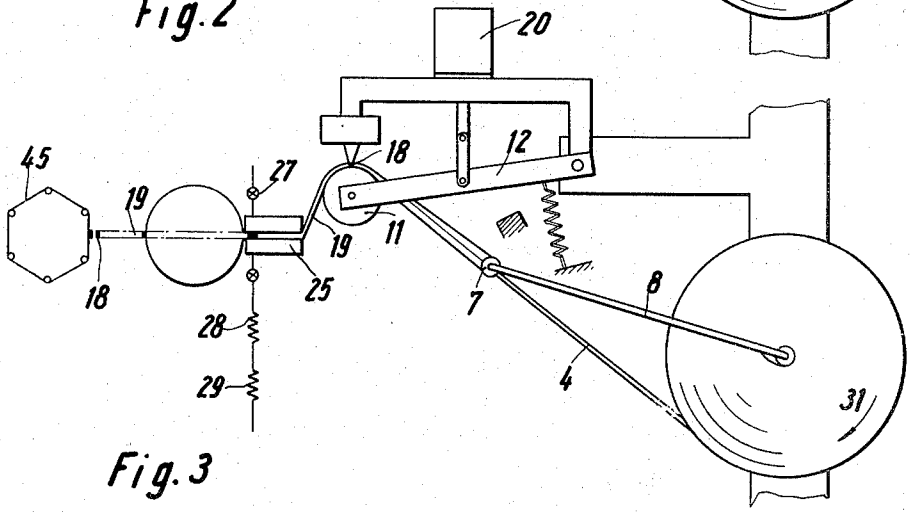


Fig. 3

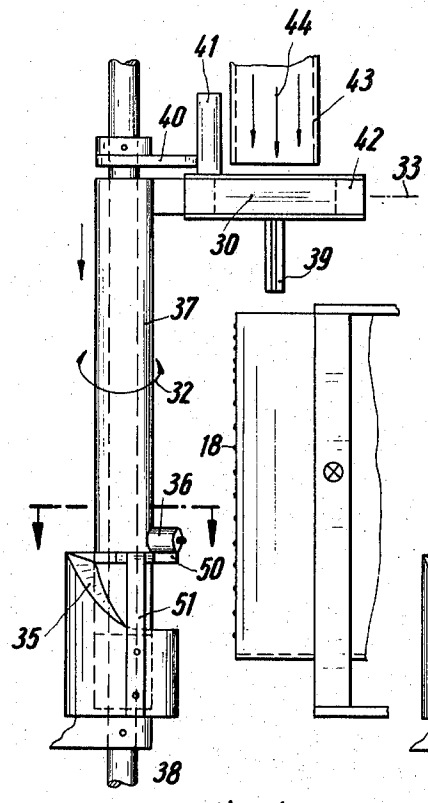


Fig. 4

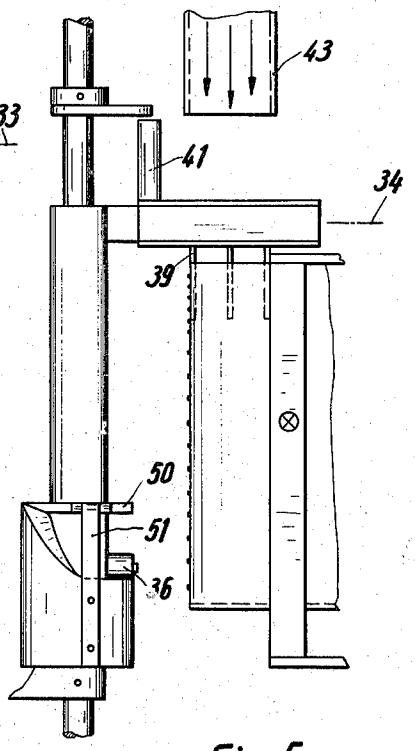


Fig. 5

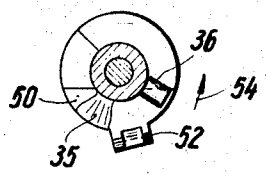


Fig. 4a

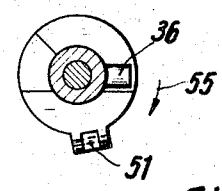


Fig. 5a

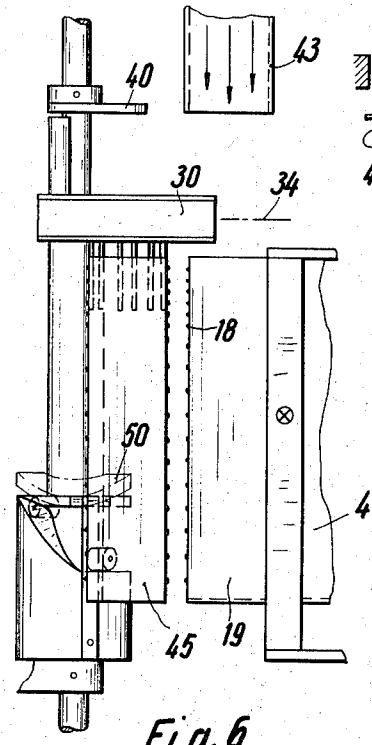


Fig. 6

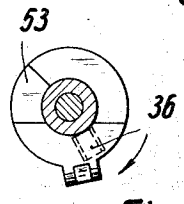


Fig. 6a

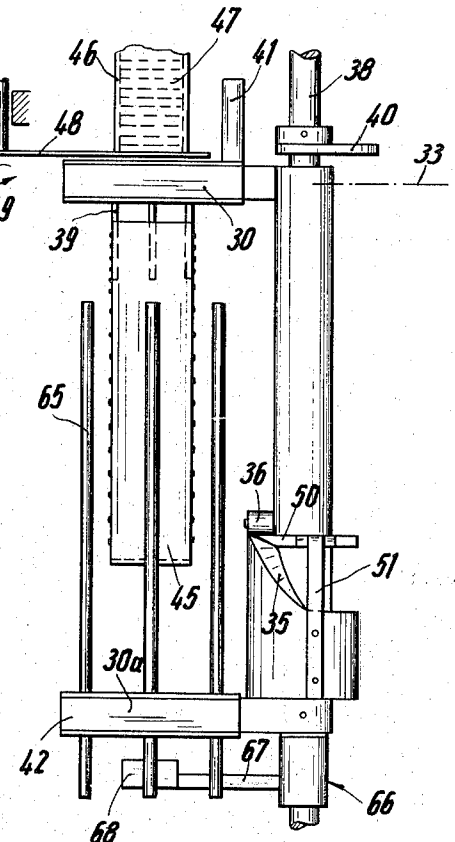


Fig. 7

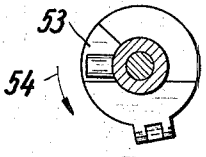


Fig. 7a

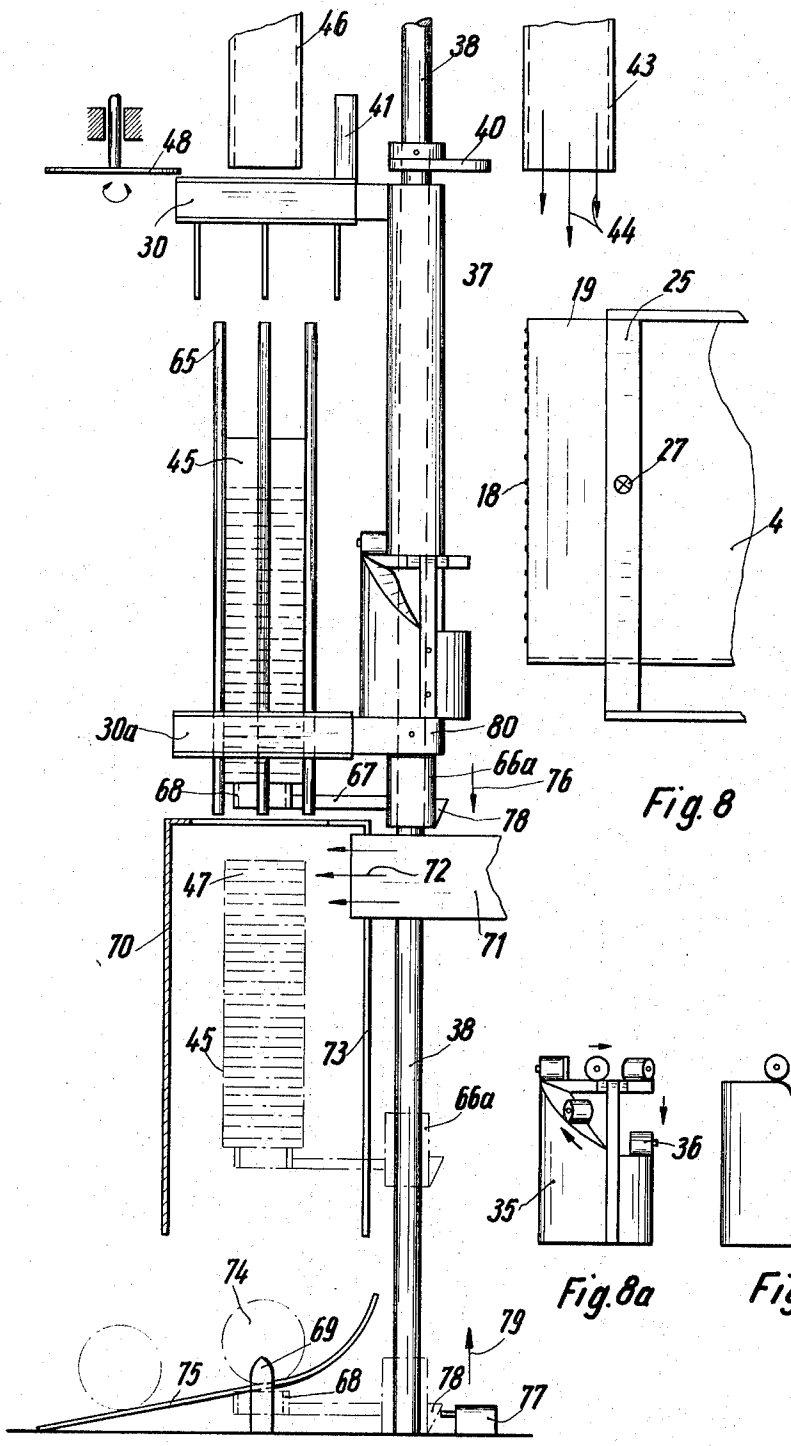


Fig. 8

Fig. 8a

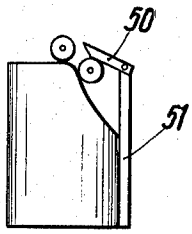


Fig. 8b

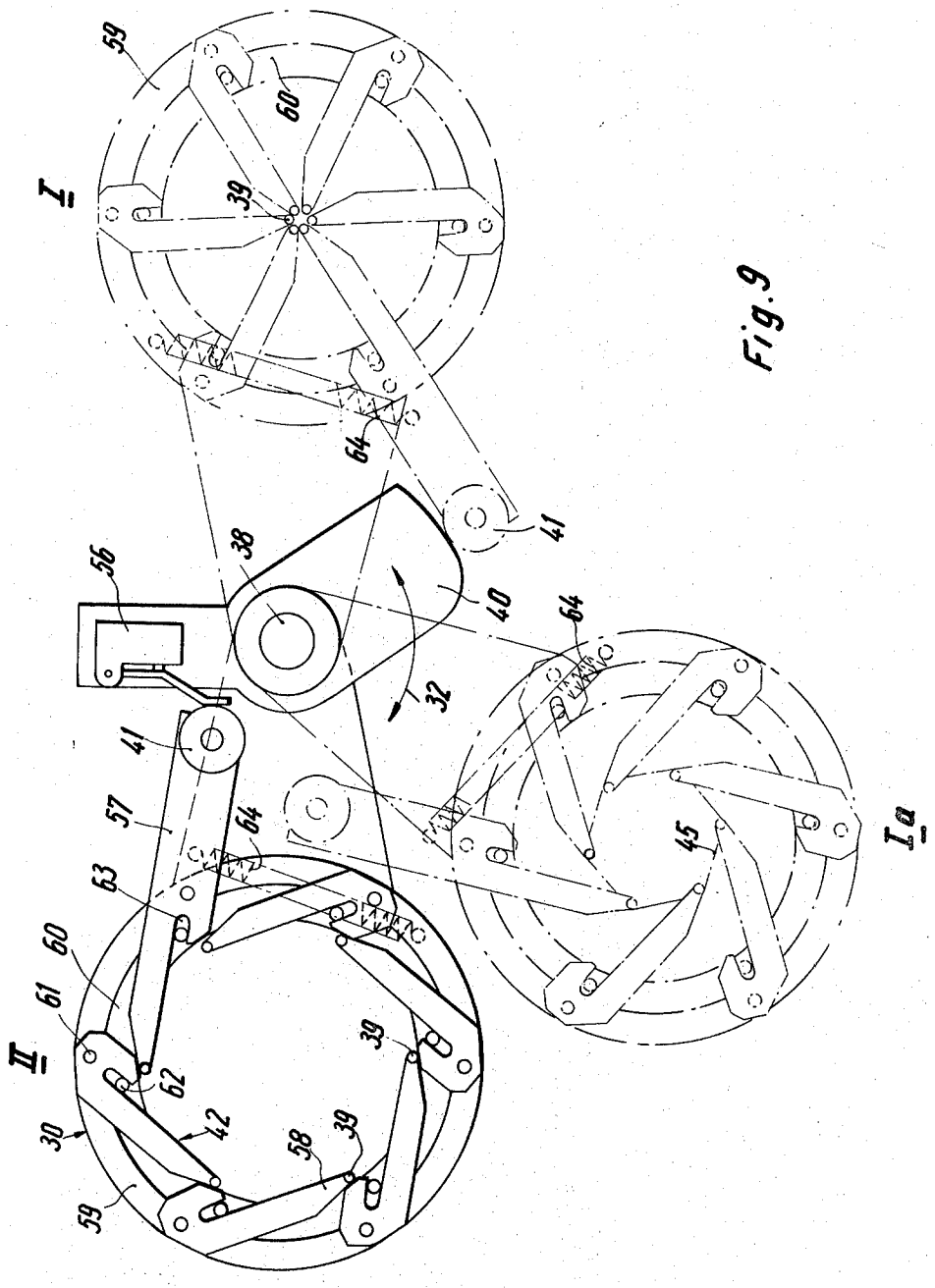


Fig. 9

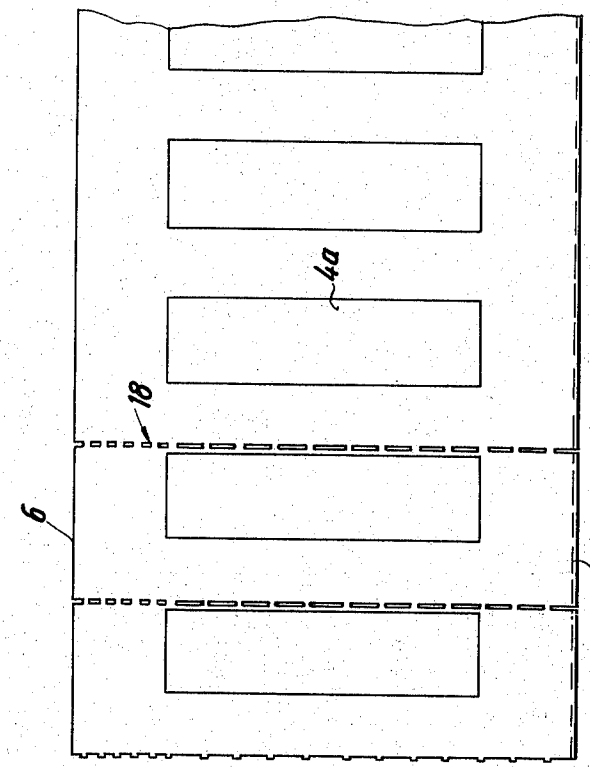


Fig. 12

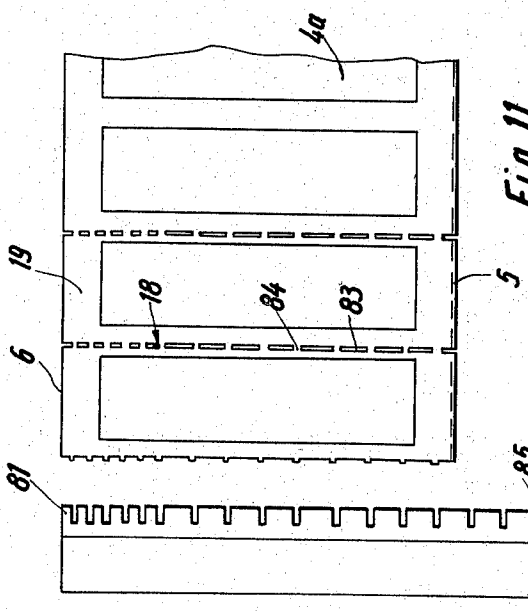


Fig. 11

Fig. 10

Fig. 10a

DEVICE FOR WRAPPING VERTICALLY PILED COINS OR THE LIKE IN BAGS MANUFACTURING OUT OF A SHRINK FILM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to article packaging devices and, in particular, to a new and useful method and apparatus for wrapping columns of uniformly shaped flat pieces in a plastic shrink film and subsequently treating the film with the treated column held continuously in vertical position in order to shrink it into tight engagement with the vertically held coins.

2. Description of the Prior Art

The wrapping of piles or columns of coins, tokens, or similar piled pieces into a film is known. There is also known to use bags made of a shrinkable film. Flexible film tubes are squeezed flat on their one end and sealed. The thus closed end of a tube forms the botom of the bag which receives a predetermined number of piled coins, whereupon the still open other end of the tube is also squeezed flat and sealed above the column. The sealed pack or roll of coins is separated from a tube of this material and falls first vertically down but is then turned by 90° into a horizontal position in which it is transported to a shrinkage oven. The oven serves to make the wrapping shrink under the supplied heat so that the film tightly applies against the column of coins. However, during the shrinkage operation, the horizontal position of the coin pile surrounded by the bag shows a drawback insofar as the coins, owing to the change of their original position, do not remain uniformly arranged within the shrinking wrapping. This shortcoming appears even when the coins are enclosed in a cushion-like wrapping which is also known and in which the coins are brought into a horizontal position and then submitted to the shrinkage.

The known bag-type wrappings do not allow the coins to be perfectly aligned and permit the formation of bucklings on the flexible tube or cushion when the film is submitted to shrinkage. In order to avoid such phenomena, there have been provided additional treatments of the loosely wrapped coin piles and, for example, the coins in the wrapping are continuously rotated about their longitudinal axis and simultaneously the film submitted to the shrinkage. Such a wrapping method and the devices necessary thereto are considerably complicated. Moreover, the use of film tubes which are sealed transversely above and below the coin pile makes it necessary to keep a stock of various film tubes for all of the usual coin diameters.

SUMMARY OF THE INVENTION

With the present invention, it is possible to manufacture wrappings of any desired diameter corresponding to the diameter of each pile to be wrapped, piece by piece, without the necessity of keeping stocks of various tubes. At the same time, the invention eliminates the possibility of a bad alignment of the coins before and during the shrinkage, without using additional operations. The whole wrapping process is simplified, improved and made less expensive.

In accordance with the invention, there is provided a method comprising the following operational steps: A shrink film band is longitudinally folded in half and longitudinally fed in vertical position, with its fold below

and the free edges above, by advance steps corresponding to the diameter of the bag having to receive the coin pile, and then heat-sealed as well as perforated at each step transversely in order to form bag side closures along a vertical line extending over the whole height of the folded band. The folded band section thus formed between the last two consecutive heat-sealings is tightly clamped in vertical position and blown up from above so as to form an open bag. By means of spreading members also introduced from above, this bag is held open, torn away from the following clamped band section and transported in this state under a storing tube containing the pile of coins. The pile is then dropped into the bag and, while still in vertical position, the filled bag of coins is lowered. During this downward movement, the bag is submitted to the shrinkage treatment so that the wrapping applies tightly against the pile without changing the orientation of the coins.

By using a folded-in-half film band as the starting material for the manufacture of the film bags, feeding the film band in vertical position with the fold below, sealing it transversely in predetermined distances and keeping the vertical position throughout the whole process, it is possible for the first time to manufacture film bags with any desired diameter, to fill the open bags with piles which are kept ready and counted off and to shrink the wrappings down without changing the mutual position of the coins. The method is simple and permits varying of the diameter of the manufactured bags merely by making slight adjustments of the bag side closing mechanism.

It is of importance for the simplicity of this method that the bag is stripped off the spreading members which hold the bag open by the dropping pile itself. The stripped off bag is caught in its fall, slowed down in the fall direction, and passed through a transverse hot air current, and at the end of its downward movement, ejected. Thus, the weight of the falling pile is utilized to loosen the bag from the spreading members by which it has up to now been held open and to permit it to shrink down while keeping the coins in their vertical pile orientation.

While in the known methods, the separation of the individual sections of the filled tube is effected by means of a heated cutting tool, according to the invention, the bag section to be filled is torn off along the vertically spaced heat seal perforations made in the side closure forming operation. The pulling force for the tearing off is applied starting from the upper edges of the folded film band, in the zone of the lower reach of the spreading members, and the resistance of the perforation against the separation decreases toward the direction of the fold. Thereby, it is made possible easily and without trouble to tear asunder even film band sections of greater height.

According to an advantageous development of the invention, there is provided a scanning of each section of the folded film band, the scanning pulse provoking the advancing of the film band by a further motion step and the subsequent heat-sealing of the perforated seam, as well as a temporary clamping of the advanced film band section and the tearing away of the precedent film band section.

The folded film band used as the starting material may be unwound from a delivery roll. In this case, the two superposed halves of the folded film band tend to adhere to each other which would prevent the band

section from being opened by the air blast. It is therefore advantageous to unfold the two halves of the folded film band before the heat-sealing operation. This can be done continuously along with the removal of the film band from the delivery roll.

The unwinding of the delivery roll, the unfolding of the two halves of the folded film band, the applying of the heat-sealing seams over the whole height of the film band, the blowing, opening and keeping open of the film band section, the tearing off of each bag from the remaining bags and the filling and shrinking are consecutive operational steps which are effected with the coins oriented in the same vertical plane which is changed only after they are completely wrapped and tightly packed when they are finally ejected.

The inventive device for packing coins comprises a mechanism for opening and transporting each bag which includes an annular pin basket with two rings which are connected together by a return spring and mounted so as to be rotatable in respect to each other. Swiveling levers are supported by the pin basket and have free ends, with pins which project downwardly and are adapted to be spread apart under the action of the return spring, up to positions corresponding to the desired diameter of the bag to be manufactured. The pin basket is slewable about a fixed vertical shaft into two positions diametrically opposed with respect to the shaft and movable on this shaft into two different end elevations by means of an elevating cam surface. In the zone of the first operating position, there is provided a pair of clamping jaws as well as a blast pipe and in the second operating position, there is mounted the storing tube, a bag lowering mechanism, and a shrinkage equipment which can be run through the lowering mechanism.

According to an advantageous development of the invention, a heated sealing bar provided with teeth of unequal length is supported by an adjustable first swivel arm and arranged in vertical position before the clamping jaws, and a second swivel arm bearing a back-up roller rotatable about a vertical axis is mounted so as to have a common vertical swivel axis with the first swivel arm. The second swivel arm bearing the back-up roller is connected to a pull magnet which intermittently presses this arm, and thereby the back-up roller along with the folded film band passed around the same, against the heat-sealing bar, counter the action of a return spring. A lever arm swings about the vertical axis of the delivery roll and has a free end with a cylindrical doctor which is adapted to engage into the folded film band and whose height corresponds to the height of the folded band. A return spring acts on the doctor to form a feeding loop for the advance of the folded film band.

The toothing of the heat-sealing bar is shaped so that the length of the teeth in the zone outside the lower reach of the pins of the pin basket is increased. In the direction of the fold of the film band, the produced perforation holes are therefore longer than in the upper part. Consequently, per unit of length, there is a smaller number of perforation webs in the lower part of the heat-sealing bar and the folded film band tears along the perforation far more easily in the direction of its lower part. Thus, the bags may be separated very easily.

There is further provided, according to another development of the invention, a cam rigidly secured to the fixed vertical shaft, against which an extended two-armed swivel lever of the pin basket can apply while pivoting in the upper level of the basket so as to produce a joining motion of the pins toward the basket center. The elevating cam surface is appropriately arranged at the lower end of the fixed shaft and adapted to cooperate with a cam foller which is supported by a guide sleeve surrounding the fixed shaft and bearing the pin basket. Thereby, the reciprocating movement of the pin basket simultaneously produces an up and down movement of the basket.

In a further development, the elevating cam surface cooperates with a lid member which is mounted off the cam surface on a support and adapted to be lifted by the raising motion of the cam roller. Thus, after reaching a horizontal path on the level of the top of the cam surface, which position corresponds to the upper level position of the pin basket, the cam roller returns running on the lid member which is an extension of the horizontal path. At the end of the lid, the roller falls down again to the lower level. This arrangement assures a continuous up and down movement of the pin basket simultaneously with its reciprocating movement. At the end of its movement in the upper level during which the pins are urged to join together to a bundle in the basket center, the pin basket falls down to the lower level where, under the action of the return spring, the pins are spread apart so as to apply against the circumference of the blown up bag. The subsequent operating movement brings the basket into an opposite position and, at the same time, in the upper level. After the filling and lowering of the bag, the pin basket returns into the first upper position.

In order to produce the joining and spreading motions of the pins, the extended swivel arm of the pin basket bears a guide roller rotatable about a vertical axis, whose axial length is equal to the mutual distance of the two levels. In the lower level, the guide roller disengages from the cooperating cam.

It is useful to provide openings for light sensing means in the clamping jaws. The light sensing means scan a print recurring in equal distances on the film band, preferably on the inner side thereof, or the perforated sealing seams of the folded film band.

A second similar pin basket equipped with upwardly projecting guide rods is provided below the elevating cam surface and arranged coaxially with the storing tube. After the filling of the bag, the guide rods apply against the pile to be wrapped and guide it during the initial fall and during the subsequent decelerated downward movement supported by the lowering mechanism.

The bag lowering mechanism is equipped with an annular support across which an ejector, operable at the end of the downward movement, passes through. Only at the end of the downward movement of the filled bag which has already been shrunk while still in its upright position, is it tilted onto a sloping chute and rolled off. This rolling movement is facilitated and assured by the uniform shrinking of the bag around the pile which has been held aligned during the whole process.

Accordingly, it is an object of the invention to provide a method for wrapping vertical columns of piled articles such as coins or the like in bags manufactured out of a shrink film, into which the coins, etc., are introduced through a storing tube, which comprises the consecutive operational steps of feeding a film band folded longitudinally in half in a vertical position and with the fold below and by consecutive steps, heat-sealing and

simultaneously perforating the folded film band along vertical lines spaced from each other at distances corresponding to the diameter of the articles of the pile to be wrapped so as to form individual bags, blowing up the bag thus obtained and holding it open by means of spreading members, tearing the bag off the rest of the film band and transporting it under the article storing tube, dropping the stored pile of articles into the bag and stripping the bag off the spreading members, lowering the bag containing the pile slowly and in vertical position through a hot air current so as to make it shrink down, and ejecting the finished tight pack.

A further object of the invention is, in order to facilitate the tearing away of the oepned bag, to provide such perforations along the sealing seams whose resistance against the tearing decreases in the downward direction.

Another object of the invention is to provide a scanning circuit which may control step by step the feeding, the clamping, sealing, tearing and other necessary operations.

Another object of the invention is to provide for an unfolding of the folded film band before the heat-sealing operation, in order to prevent the mutual adhering of the two halves of the folded band.

A further object of the invention is to provide a device for carrying out the proposed method, comprising an annular pin basket with two rings mutually connected by a return spring and rotatable in respect to each other, swiveling levers mounted on the pin basket and bearing pins which are projecting downwards and adapted to be spread apart so as to apply against and hold the open bag, a fixed vertical shaft about which the pin basket can slew into two diametrically opposed positions, an elevating cam surface and a cam roller cooperating therewith to enable the pin basket to perform an up and down movement in addition to its slewing movement, clamping jaws and a blast pipe in the zone of the first extreme position of the basket, and a storing tube, a bag lowering mechanism and a shrinkage equipment in the zone of the second extreme position of the basket.

Another object of the invention is to provide a heat-sealing bar supported by an adjustable first swivel arm and arranged in vertical position before the clamping jaws, a second swivel arm bearing a back-up roller and connected to a pull magnet which intermittently presses this arm with the back-up roller and the folded film band against the heat-sealing bar, counter to the action of a return spring, a cylindrical doctor mounted on a swinging lever arm and engaging into the folded film band in order to unfold the same before the heat-sealing operation, and to provide the heat-sealing bar with unequal toothing so as to produce a closure seam in the upper part which is more resistant to tearing than in the lower part, and thus to facilitate the tearing away of the bags even when using film bands of unusual height.

A further object of the invention is to provide on the pin basket an extended swivel arm which cooperates with a cam rigidly secured to the fixed vertical shaft so as to produce, in a first operating position of the basket, a joining motion of the pins toward the basket center.

Another object of the invention is to provide a lid member cooperating with the elevating cam surface and the associated cam roller so as to permit the cam roller to raise on the cam surface to the higher level and to return on the lid member, which is an extension of the higher level horizontal surface, until it drops, at the end of the lid member, again to the lower level.

Another object of the invention is to provide on the extended swivel arm a guide roller whose axial length is equal to the mutual distance of the two motion levels of the pin basket so that after the dropping of the basket in its first slewing position, the guide roller disengages from the cam and enables the pins to spread apart.

A further object of the invention is to provide openings in the clamping jaws for a light sensing device which may scan either a print applied on the inner side of the folded film band or the heat-sealing seam of each bag section.

Another object of the invention is to provide a second pin basket arranged below the elevating cam surface and under the storing tube, which is equipped with guide rods projecting upwards and adapted to move radially inwardly and apply against the filled bag during the lowering movement thereof.

Still another object of the invention is to provide the lowering mechanism with an annular support which the ejector arranged at the end of the downward movement may pass.

For an understanding of the principles of the invention, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings:

FIG. **1**, **2** and **3** are partial top plan views schematically showing the three basic operational steps in the manufacture of bags out of a film band folded in half, according to the invention;

FIGS. **4** to **7** are partial elevational views illustrating the operational steps shown in FIGS. **1**, **2** and **3**;

FIGS. **4***a* to **7***a* are top plan views, partly in section, of the elevating cam surface zone shown in FIGS. **4** to **7**;

FIG. **8** is a supplmented elevational view to FIG. **7**, where the bag is shown already filled;

FIGS. **8***a* and **8***b* show in two different elevational views the cooperation between the elevating cam surface and the associated cam roller and lid member during an operational cycle;

FIG. **9** is a partial top plan view of the pin basket in different positions during the operational cycle illustrated in FIGS. **1** to **8**;

FIG. **10** is a lateral elevational view of the heat-sealing bar provided with an unequal toothing;

FIG. **10***a* is a top plan view according to FIG. **10**; and

FIGS. **11** and **12** are partial elevational views of folded film bands showing the perforated heat-seal seams of two bands of different height, the perforations being made in both cases with the sealing bar according to FIG. **10**.

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in particular, the invention embodied therein comprises a device for making, filling, closing and shrink tightening bags of shrinkable film for packaging coins therein. As shown in FIGS. **1–3**, the machine includes a frame **1** supporting a supply roll **3** mounted on an axle **2**. A shrink film band **4**

is wound on the roll **3.** The film band **4** is not a single layer strip but a band of shrink film longitudinally folded in two so that in the vertical feeding position, the fold forms the bottom edge **5.** The two upper free edges are designated **6.** The two halves of the film band tend to adhere to each other. They are unfolded by means of a cylindrical doctor **7** which engages into the band and whose height is approximately equal to the height of the folded band. The doctor **7** is supported by a lever arm **8** pivoting about the axis **2,** as indicated by the arrow **9,** and biased by the action of a return spring **10** in a counterclockwise direction. The doctor **7** forms a feeding loop for the advance of the folded film band **4,** as it is shown in FIG. **1.**

The film band unfolded by the doctor **7** is passed around a vertical back-up roller **11** which is rotatably mounted on the end of a swivel arm **12** with a swivel axis **13.** The swivel arm is connected to a return spring **14** by which it is urged against the stop **15.** The back-up roller **11** faces a heat-sealing bar **16** which is provided with teeth, arranged vertically, and supported by an adjustable swivel arm **17** which can be locked in its swivel position. FIG. **1** shows another swivel operating position in dash-dot lines. This swivel position is decisive for the selected diameter of the film bag to be manufactured and, consequently, for the distance of two consecutive heat-seal seams **18** of a film band section **19.**

To produce a heat-seal seam **18,** a kinetic impulse is given to the swivel arm **12** of the back-up roller **11** by the electrically operated pull magnet **20** whose control lines are designated **21.** The pull magnet comprises a plunger-type armature **22** which is articulated to the swivel arm **12** over an intermediate lever **23.** The pull magnet is supported by the crossbar portion **24** of the forked swivel arm **17.**

A pair of clamping jaws **25** is mounted behind the back-up roller in respect to the feeding direction. The clamping jaws are provided with openings **26** for light from light sensing means which includes sensor **27** and two timing elements **28** and **29** connected in the control line **21.** The timing element **28** controls an operating magnet (not shown) of the clamping jaws **25** and the timing element **29** controls the pull magnet **20.** The advance of the folded film band and the tearing away of the respective section along the perforated seam **18** is effected by a pin basket generally designated **30.** A continuous reciprocating drive (not shown) is connected to the pin basket and it is moved while the clamping jaws **25** are open, from the position shown in FIG. **1** to the position shown in FIG. **2** to engage the interior of the feeding loop of the film band. In the position shown in FIG. **2,** the side closure seam **18** to be scanned is located close to and before the light sensor **27.** The pair of clamping jaws **25** and **26** are still open. In the following instant, the heat-seal seam **18** comes in the path of the light barrier **27.** The scanning pulse causes an immediate closing of the clamping jaws **25** and **26** and almost simultaneously the attraction of the pull magnet **20** so that the back up roller is moved against the heat-sealing bar **16** and the subsequent heat-seal **18** is produced. During this motion step, the folded film band **4** is advanced and partially removed from the supply roll **3** in the direction as shown by the arrow **31** (FIG. **3**). The film band section seized by the pin basket and held as an open bag is transported away and finally torn off the remaining film band section **19,** which, in FIG. **3,** is represented in dotted lines. The tearing takes place along the perforated seam **18.** The separated bag is then filled in the filling station and stripped off the pin basket which, in the following part of the operational cycle, returns in its position shown in FIG. **1.** The subsequent section of the film band, which in FIG. **3** is represented in broken lines, is blown up to an open bag immediately after the tearing away of the precedent band section, as it is shown in FIG. **3.** The film band section is torn off while the clamping jaws are closed. According to the adjustment of the timing element **29,** the pull magnet **20** is released after a selected time period. A new feeding loop forms due to the spring pressure on the doctor **7** which reoccupies the position shown in FIG. **1** in which the clamping jaws open after the time set according to the adjustment of the timing element **28.** The whole cycle is then repeated.

The further operational steps may be better seen in FIGS. **4–7** and **4***a*–**7***a*. The transport of the pin basket **30** as represented in FIGS. **1–3** is effected in the course of a rotating or pivoting movement which is indicated by the double arrow **32** in FIG. **4.** Aside from this movement, the pin basket **30** is moved up and down between an upper level **33** and a lower level **34** (FIGS. **4** and **5**). This second movement, in vertical direction, is derived from the pivoting movement and brought about by an elevating cam surface **35** which cooperates with a roller **36** mounted on a horizontal axis of a guide sleeve **37** of the pin basket **30.** The elevating cam surface **35** is secured to a vertical fixed shaft **38** and also moves the guide sleeve **37** up and down. The shaft **38** is positioned so that in one extreme position of the pin basket, the projecting pins **39** of the basket **30** extend approximately over the middle of the film band section **19** which extends outwardly from the clamping jaws **25** and from which the preceding section has already been torn away along the perforated heat-seal seam **18.**

FIGS. **4** and **5** correspond to the position shown in FIG. **1.** The pins **39** joined in a bundle are positioned in the upper level while the pins **39,** which are spread apart to the diameter of the bag section and introduced into the open bag, are positioned in the lower level **34.** The radial inward motion of the pins into the position according to FIG. **4** is produced by means of a guide cam **40** which also is rigidly secured to the shaft **38.** The pin basket is provided with a guide roller **41** which causes the displacement of the pins **39** into their central position according to FIG. **4** as soon as it comes into contact with the guide cam.

The pin basket is of annular shape. In the receiving position of the pin basket, according to FIG. **4,** the blast pipe or air supply pipe **43** is situated above the basket **30.** The continuous air stream directed downwards from pipe **43** and indicated by the arrows **44** blows the respective film band section **19** up to an open bag, as shown in FIG. **1.** The pins **39** can be introduced from above into the blown up bag section situated at the lower level **34** as soon as the guide roller **41** disengages from the guide cam **41.** The axial length of the guide roller is equal to the spacing between the two levels **33** and **34.**

At the moment of disengagement of the guide roller **41** from the guide cam **40,** a return spring provided in a setting mechanism **42** becomes effective and spreads the pins **39** apart to the diameter of the blown up bag section and holds them in this position. The pin basket **30** with its pins **39** carries out the transportation of the

bag section of the film band from the position of FIG. 1 to the position of FIG. 2 and then to the position of FIG. 3 which corresponds to FIG. 6. During the pivotal movement of the pin basket 30, the bag 45 seized by the pins 39 is torn off the subsequent film band section 19 along the perforated heat-seal seam 18 and separately brought into the filling station in which the storing tube 46 is mounted. The tube 46 contains a separate number of counted coins in a pile of coins 47 which is retained by a rotary shutter or door 48 at the bottom opening of the tube. The swinging movement of the rotary shutter is indicated by the arrow 49. As soon as the shutter opens the tube, the coin pile 47 drops into the bag 45 which, due to the added weight of the coins, is stripped off the pins 39.

In order to obtain a continuous vertical movement only of the pin basket, there is provided a lid member 50 positioned adjacent to the elevating cam surface 35 but hinged off the same, on a support 51. The lid member swivels about a horizontal axis 52 when it is pushed from below by the roller 36 and lifted. The roller 36 runs upwardly onto the upper horizontal portion 53 of the elevating cam surface and then, in the return movement, on the upper surface of the lid member which, in the meantime, has returned in its horizontal position as shown in FIG. 4*a*. The roller continues its movement in the direction of the arrow 54 in FIG. 4*a*, slides from the lid member at the end thereof and falls down into the position represented in FIGS. 5 and 5*a* in which the pin basket occupies its position in the lower level 34. From there, the roller 36 returns again and runs up the elevating cam surface 35. In FIGS. 6 and 6*a*, the roller is represented in a position close below the lid member. The roller lifts the lid member again and runs up to the horizontal portion 53 at the top of the elevating cam surface, therefrom again over the upper surface of the lid member in the return movement according to arrow 54. The reciprocating movement in the direction of arrows 54 and 55 and the movement of the pin basket between the two levels 33 and 34 continues in a repeated cycle.

The reciprocating movement of the pin basket 30 about the shaft 38 is brought about by a periodical slewing drive indicated by the double arrow 32. The turning angle amounts to 180° so that the two extreme positions in the reception station I and in the filling station II (FIG. 9) are diametrically opposed. The return movement of the pin gasket from the position II into the position I is controlled by the actuation of a microswitch 56 against which the guide roller 41 finally applies. The guide roller is supported by the two-armed swivel lever 57 of the setting mechanism 42 which comprises a plurality of swivel levers 58. Each swivel lever supports on its end a pin 39. The displacement of the pins is effected by means of two rings 59 and 60 adapted to be mutually shifted. The swivel levers are mounted on fixed axes 61 provided on the outer ring 59 and are moved by means of dogs 62 provided on the inner ring 60 and engaging into open slots 63 of the swivel levers. The swivel arm 57 is an extended swivel lever which, when actuated, causes the mutual shifting of the two rings.

As it may be seen in FIG. 9, in the position I, the pin basket is closed owing to the cooperation of the guide roller 41 with the guide cam 40. On the contrary, in the position II, the basket is open. The opening is effected by by a return spring 64 which is fixed to the outer arm of the swivel arm 57 and to the outer ring 59. The return spring is effective as soon as the guide roller 41 disengages from the guide cam 40, that is as soon as the pin basket comes into the lower level position 34. In FIG. 9, this position is designated as I*a*. It is a position in which the pins have seized the bag 45 and already torn it away from the remaining bags. The position I*a* of FIG. 9 corresponds to the positions according to FIGS. 3 and 6.

FIG. 7 shows the filling position of the not yet filled bag 45 again. The pin basket is in its upper level 33 close to the storing tube 46. A second pin basket 30*a* is mounted below the elevating cam surface 35, coaxially with the storing tube 46. The pin basket 30*a* comprises substantially upwardly extending guide rods 65 which, in their closing position according to FIG. 8, apply, under a light spring pressure, against the filled and downwardly falling coin bag. The second pin basket may be controlled by an appropriate control pulse actuating a control magnet (not shown). The second pin basket also comprises a setting mechanism 42 corresponding to the setting mechanism of the pin basket 30 so that all of the provided guide rods are automatically adjusted to the diameter of the dropping pile. This second pin basket is rigidly fixed to the shaft 38. Below the pin basket 30*a*, there is provided a bag lowering mechanism, generally designated 66 (FIG. 7). Such lowering mechanisms are known and, therefore, the mechanism is not described in detail. It executes a reciprocating shifting movement upwardly and downwardly on the shaft 38, as it may be seen in FIG. 8.

Substantially only one sleeve 66*a* of the lowering mechanism which is movable on the shaft 38 is represented, supporting a jib 67. The jib 67 bears an annular support 68 wth an opening or slot 68*a* through which an ejector 69 passes in the zone of the lower extreme position of the lowering mechanism. In its downward movement, the jib 67 passes through a shrinkage chamber 70 to which a hot air pipe 71 is connected. The hot air current is indicated by the arrows 72. The current is directed transversely against the bag 45 which is filled with the pile to be wrapped and is slowly moved downwardly, and whose upper edge protrudes above the height of the pile. To permit the passing of the jib 67, a vertical through-slot 73 is provided in the casing of the shrinkage chamber. During the passage through the shrinkage chamber, the film bag 45 shrinks down and applies tightly against the coin pile 47. At the same time, the protruding end portion of the film bag 45 closes the coin pile from above. The finished wrapped coin pile becomes a coin roll 74 which, at the end of the lowering movement of the mechanism, is tilted into a horizontal position by the action of the ejector 69 and passes on a sloping chute 75.

The downward motion of the lowering mechanism in the direction of the arrow 76 is effected by a non-represented motor-operated drive. A limit switch 77 actuated by a nose 78 provided on the sleeve 66*a* of the lowering mechanism closes the circuit for the return upward movement in the direction of the arrow 79. However, the most simple return movement may be effected by a return spring which is not represented. The upper position of the sleeve 66*a* of the bag lowering mechanism is limited by the mounting bracket 80 of the lower pin basket 30*a*.

FIGS. 8 and 8*a* again show the motion cycle of the roller 36 on the elevating cam surface 35 in coopera-

tion with the lid member **50**, in another representation.

It is of importance for an easy tearing of the film along the perforated seam **18** down to the longitudinal fold, that the tearing is effected with a decreasing resistance in this direction. For this purpose, there is provided a heat-sealing bar represented in FIGS. **10** and **10***a*, which is electrically heated in a known manner. In accordance with FIGS. **1–3**, this sealing bar is designated by **16**. The bar is vertically mounted and provided, in its upper part corresponding to the dipping reach of the pin basket pins **39**, for example with six short teeth **81** and, outside the mentioned part, with substantially longer teeth **82** which, consequently, produce longer perforation holes **83**. Thus, the perforation webs **84** in the lower part of each film band section **19** are spaced at larger distances then in the upper part and, in relation to the tearing length, their number is smaller. The perforation webs **84** correspond to the tooth gaps **85** on the sealing bar **16**. This shape of the perforation seams is independent of the height of the bags to be manufactured, as it can be learned from the comparison of FIGS. **11** and **12**.

In case of wrapping coin piles, the film bags are provided with prints **4***a* uniformly spaced and indicating the content of the pack. These prints are mostly applied to the inner side, in order to prevent their use. The sensor **27** may scan the prints **4***a* instead of scanning the sealing seams **18**.

The spreading force of the pins **39** is absorbed by the narrower perforation to which also the pulling force necessary for the tearing, which starts from the longitudinal edges **6**, is applied. In the lower part, the tearing requires a decreasing force corresponding to the lower resistance of the part with the longer perforation holes **83**.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. An apparatus for packing piles of small flat articles such as coins in shrinkable film material, comprising support means for stacking a pile of the articles, a supply of longitudinally folded shrinkable film, means for feeding a length of said longitudinally folded shrinkable film from said supply along a feed path extending below said support means with the folded end extending downwardly, bag forming means located along said feed path length engageable with said shrinkable film along vertical lines which are longitudinally spaced and extend substantially perpendicular to said foldline, and forming bag side closures at spaced longitudinal locations, bag opening means engageable into the interior of each bag which is formed in succession to spread it open before it is moved below said support means so that when each bag arrives below said support means it is fully opened, said support means including a movable support to drop a pile of the articles into the fully opened bag, said bag being disengageable from said bag opening means upon being filled with the articles, and means for supporting said bag in its vertical position after it is filled with the articles so as to hold the articles vertically, and means for treating the film with the articles therein in order to shrink the film over the articles and cause it to tightly engage the articles, said bag opening means comprising an annular pin basket with two rings which are mutually connected by a return spring and mounted so as to be rotatable in respect to each other, swivel levers supported by said pin basket and provided on their free ends with pins which project downwardly and which are movable upon relative rotation of said rings on the action of said return spring to open outwardly within said bag to an amount to expand said bag to the selected diameter of the bag to be manufactured, and including cam means for moving said pin basket between different levels in which said pins extend downwardly into said bag and are lifted upwardly above said bag.

2. An apparatus according to claim **1**, including blowing means overlying said folded sheet of film engageable into the opening of each bag which is formed to blow the bag parts open before they are engaged by said bag opening means.

3. An apparatus according to claim **1**, wherein said bag forming means comprises a heat-sealable member engageable with said length of shrinkable film, clampable means for clamping said film in a fixed position and means for periodically moving said film into engagement with said heat-sealing means when it is clamped into position in order to form a side closure seal extending upwardly from the foldline to the top of said bag.

4. An apparatus according to claim **3**, wherein said heat-seal lines are disposed at a spacing corresponding to the diameter of said bag, said heat-sealing means and said means for directing said folded sheet film into association with said heat-sealing means being adjustable to alter the spacing between said heat-sealing lines.

5. A device according to claim **1**, wherein said bag forming means comprises a heated sealing bar having a plurality of spaced teeth located along one side of said feed path, means for periodically shifting said folded sheet of film material into engagement with said sealing bar and clamping means for clamping said web when said web is shifted by said means into engagement with said sealing bar.

6. An apparatus according to claim **1**, including clamping jaws for engaging said folded sheet of shrinkable film, light sensing means adjacent said jaws for sensing fixed indications along the length of said film for operating said clamping jaws and means response to said sensing means to apply a heat closure sealing to said folded web.

7. An apparatus for packing piles of small flat articles such as coins in shrinkable film material, comprising support means for stacking a pile of the articles, a supply of longitudinally folded shrinkable film, means for feeding a length of said longitudinally folded shrinkable film from said supply along a feed path extending below said support means with the folded end extending downwardly, bag forming means located along said feed path length engageable with said shrinkable film along vertical lines which are longitudinally spaced and extend substantially perpendicular to said foldline, and forming bag side closures at spaced longitudinal locations, bag opening means engageable into the interior of each bag which is formed in succession to spread it open before it is moved below said support means so that when each bag arrives below said support means it is fully opened, said support means including a movable support to drop a pile of the articles into the fully opened bag, said bag being disengageable from said bag opening means upon being filled with the articles, and

means for supporting said bag in its vertical position after it is filled with the articles so as to hold the articles vertically, and means for treating the film with the articles therein in order to shrink the film over the articles and cause it to tightly engage the articles, said bag forming means comprising a heated sealing bar having a plurality of spaced teeth located along one side of said feed path, means for periodically shifting said folded sheet of film material into engagement with said sealing bar and clamping means for clamping said web when said web is shifted by said means into engagement with said sealing bar, said heated sealing bar being supported by an adjustable first swivel arm and arranged in a vertical position adjacent said clamping jaws, a second swivel arm bearing a back-up roller rotatable about a vertical axis mounted so as to have a common vertical swivel axis with said first swivel arm, said second swivel arm bearing the back-up roller being connected to a pull magnet which intermittently presses said second swivel arm and thereby the back-up roller along with the folded film web against said heat-sealing bar, and a doctor roller engageable with said web between the folded portions thereof to spread said web as it is being fed.

8. An apparatus for packing piles of small flat articles such as coins in shrinkable film material, comprising support means for stacking a pile of the articles, a supply of longitudinally folded shrinkable film, means for feeding a length of said longitudinally folded shrinkable film from said supply along a feed path extending below said support means with the folded end extending downwardly, bag forming means located along said feed path length engageable with said shrinkable film along vertical lines which are longitudinally spaced and extend substantially perpendicular to said foldline, and forming bag side closures at spaced longitudinal locations, bag opening means engageable into the interior of each bag which is formed in succession to spread it open before it is moved below said support means so that when each bag arrives below said support means it is fully opened, said support means including a movable support to drop a pile of the articles into the fully opened bag, said bag being disengageable from said bag opening means upon being filled with the articles, and means for supporting said bag in its vertical position after it is filled with the articles so as to hold the articles vertically, and means for treating the film with the articles therein in order to shrink the film over the articles and cause it to tightly engage the articles, said bag opening means comprising a pair of oppositely rotatable rings, a plurality of pivot arms pivotally mounted on said rings and having inner ends carrying vertically extending pins which are engageable into the bags with the other of said rings having a control member thereon engageable with said lever arms to shift said lever arms upon relative rotation of said rings, a shaft carrying said rings and being pivotal through a substantially 180° of arc, and cam means defined between said shaft and said lever arms to shift said lever arms with said rings to move said depending pins together in one end position of the arc of movement of said rings and to open them up in an opposite end position of arc of movement of said rings.

9. A device according to claim **8**, including cam means carried on said shaft cooperable with a cam roller carrying said pin basket to effect an upward and downward movement of said pin basket and said pins for the insertion and retraction of said pins from the bags.

10. A device according to claim **9**, wherein said elevating cam surface of said cam means cooperates with a lid member which is mounted separately from said cam means on a support and forms an exterior of the upper horizontal portion of said cam surface and is adapted to be lifted by the rising motion of said cam follower so that during its return movement the cam roller runs over said lid member and at the same time falls down into said lower level.

11. An apparatus according to claim **9**, wherein one of said lever arms includes an external roller follower, said follower being rotatable with said rings through the arc of pivotal movement and a cam engageable with said roller carried on said shaft.

12. An apparatus for packing piles of small flat articles such as coins in shrinkable film material, comprising support means for stacking a pile of the articles, a supply of longitudinally folded shrinkable film, means for feeding a length of said longitudinally folded shrinkable film from said supply along a feed path extending below said support means with the folded end extending downwardly, bag forming means located along said feed path length engageable with said shrinkable film along vertical lines which are lohgitudinally spaced and extend substantially perpendicular to said foldline, and forming bag side closures at spaced longitudinal locations, bag opening means engageable into the interior of each bag which is formed insuccession to spread it open before it is moved below said support means so that when each bag arrives below said support means it is fully opened, said support means including a movable support to drop a pile of the articles into the fully opened bag, said bag being disengageable from said bag opening means upon being filled with the articles, and means for supporting said bag in its vertical position after it is filled with the articles so as to hold the articles vertically, and means for treating the film with the articles therein in order to shrink the film over the articles and cause it to tightly engage the articles, said bag opening means including downwardly extending pins engageable within the interior of said bag and movable outwardly to open said bag and to hold said bag until it is filled with the articles, a lowering mechanism directly below said bag opening means engageable with the exterior of said bag and holding it in a vertical position and being movable downwardly, and said treatment means being located in the path of downward movement to shrink the film on the bag while it is being held in a vertical position.

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