Aug. 9, 1966 W. A. BROWN ET AL 3,264,794

PACKAGING APPARATUS

Filed March 26, 1963 3 Sheets-Sheet 1

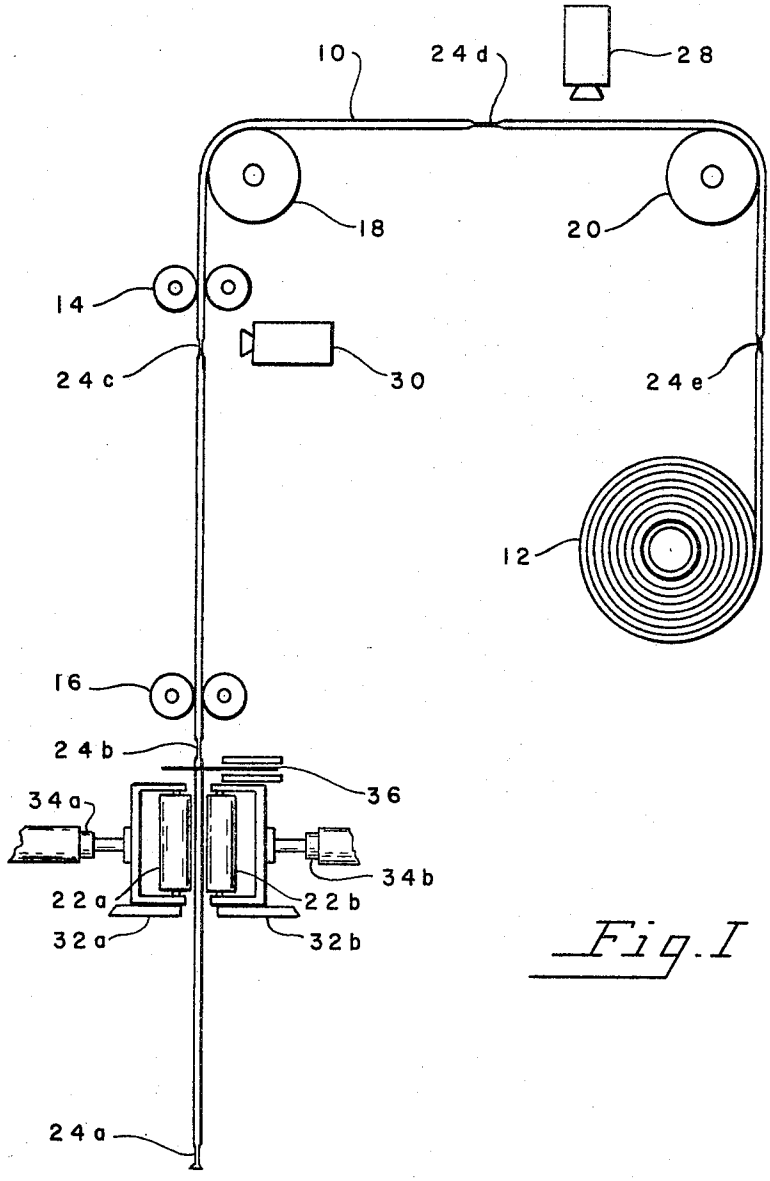


Fig. I

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PACKAGING APPARATUS

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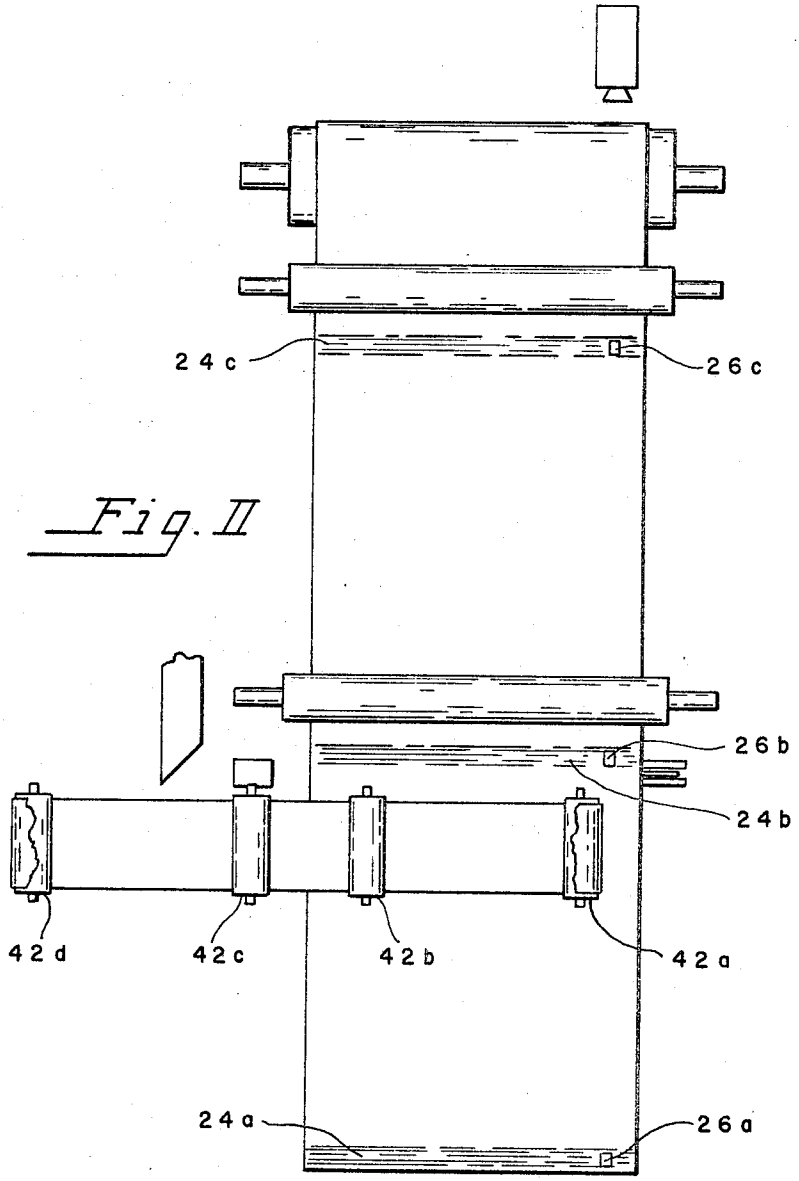


Fig. II

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PACKAGING APPARATUS

Filed March 26, 1963 3 Sheets-Sheet 3

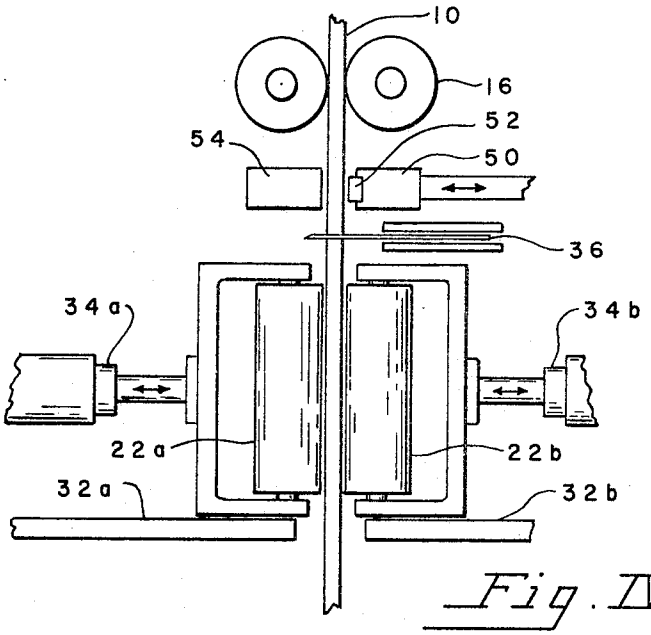


Fig. IV

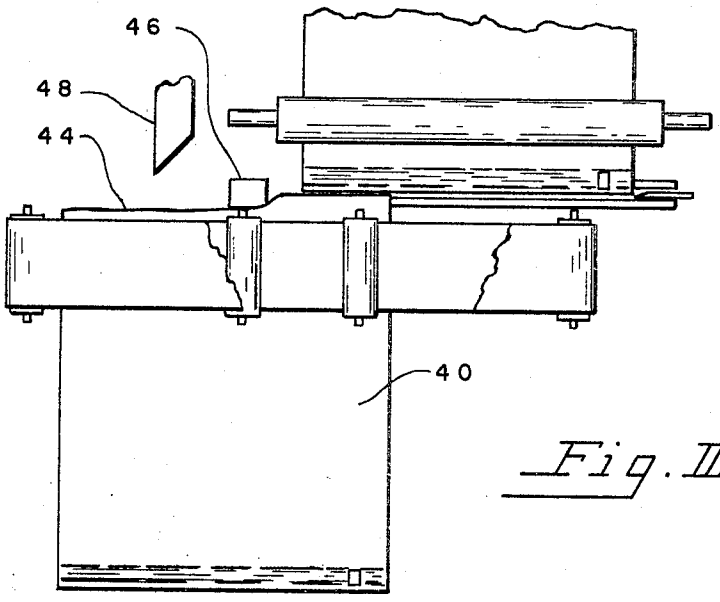


Fig. III

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United States Patent Office 3,264,794 Patented August 9, 1966

3,264,794

PACKAGING APPARATUS

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Filed Mar. 26, 1963, Ser. No. 267,978
8 Claims. (Cl. 53—29)

The present invention relates to the packaging of materials in plastic bags. More specifically, this invention relates to packaging apparatus which uses a continuous tube of plastic material fed to the apparatus from a roll of the material in flattened condition.

Up to the present time, the general method for packaging pulverulent or other materials of volumetric capacities of more than one cubic foot has been to fill essentially rectangular bag blanks which are supplied to the filling or bagging machine from a magazine containing the bag blanks or other type of stacked arrangement. When the body of the bag was comprised of paper or other materials which had some rigidity, few difficulties were encountered with the general operations associated in the packaging steps, i.e., bag blank pick-up, opening, filling, etc. However, with the advent of the thermoplastic type bags serious problems were encountered when the more flexible thermoplastic materials were used as packaging materials. In particular, the extreme flexibility of many of the thermoplastic materials which have been fabricated into bags has caused serious difficulties, i.e., plug-ups, jamming, etc. during pickup and transfer of the bag blank from the magazine or stack to the filling station. These problems were further aggravated due to the difficulties of opening and supporting the rather flexible bag blanks before and during the filling operation. It has now been found that these problems are substantially resolved by new and novel packaging means and expedients which are simple in application but which present hitherto unappreciated results.

Accordingly, it is the principal object of this invention to provide improved apparatus means and methods for packaging materials in thermoplastic bags.

Another object of this invention is to provide apparatus means and methods for packaging materials which utilizes a continuous tube of plastic material in flattened condition.

Other objects of the present invention will in part be obvious and will in part appear hereinafter.

These and other objects are attained by transversely sealing a continuous tube of thermoplastic material at predetermined intervals along its length, transversely severing the tubular material adjacent each seal to form a bag blank sealed at one end, transferring the bag blank to a filling station where it is filled with materials to be packaged, after which its open end is closed. A special expedient may be used for separating the parallel edges at the open end of the bag sufficiently to permit the bag to be filled which comprises clamping the bag blank across its width ½ to 1½ inches adjacent its open end and causing a projection to move parallel and in contact with the open end of the bag.

The following drawings are provided for the purpose of illustrating various embodiments of the present invention.

FIG. I is a side view, partly in section and with parts broken, illustrating mechanism for feeding and severing a continuous tube of thermoplastic film.

FIG. II is a front view, partly in section and with parts broken, of the same embodiment shown in FIG. I.

FIG. III is a front view, partly in section and with parts broken, of the same embodiment shown in FIG. II except that the thermoplastic tube has been severed forming a bag blank which is in a stage of lateral advancement.

FIG. IV is a fragmentary side view, magnified and with parts broken, illustrating a modified embodiment of the present invention wherein the apparatus is adapted to heat seal the tube of thermoplastic film at predetermined intervals.

Referring in detail to the figures of the drawings, and more specifically to FIGS. I and II, there is schematically shown apparatus for packing materials in thermoplastic bags. More specifically, a continuous tube of thermoplastic film **10** is unwound from roll **12** and advanced by means of pull rolls **14** and **16** over support rolls **18** and **20**, between the said pull rolls **14** and **16** to and between clamping belts **22***a* and **22***b*. In the embodiment shown in FIGS. I and II, the tubular film material **10** is shown transversely sealed such that the layers of the tube are adhered or fused together, at predetermined intervals along its length, i.e., **24***a*, **24***b*, **24***c*, etc., as it is unwound from roll **12**. In this embodiment, the tubular film **10** was sealed during a prior separate operation not shown in FIGS. I and II. As illustrated in FIG. IV, it is sometimes desirable to transversely seal the tubular film after it is unwound from roll **12** in timed conjunction with the later severing operation.

In the embodiment illustrated in FIGS. I and II, color bands **26***a*, **26***b*, **26***c*, etc. are marked at one end of each transverse seal **24***a*, **24***b*, **24***c* . . . etc., respectively, at a position that will enable the color bands to pass directly in front of the lens of electric eyes **28** and **30** as the tubular film **10** advances. These bands may be of any color which is sufficiently distinct from the tubular film to permit detection by the electric eyes. In general, it is preferable that the length of the color mark in the direction of advance be at least ⅛ of an inch or more depending, of course, on the sensitivity of the electric eyes. The purpose of the color bands and the electric eyes are to control the movement of the plastic film **10** as it advances towards clamp belts **22***a* and **22***b*. Clamp belts **22***a* and **22***b* are designed to move together on tracks **32***a* and **32***b* activated by pistons **34***a* and **34***b* when a predetermined length of film is positioned therebetween and film travel has been halted, after which knife **36** moves laterally across the tubular film severing same.

In the sequence of operations, pull rolls **14** and **16** are revolved to unwind and advance the tubular thermoplastic film **10**. In the course of film advancement, a color bar marked on film **10** passes in front of electric eye **28** which detects the mark. Upon detection, electric eye **28** transmits a signal via electric means, not shown, to stop pull rolls **14** and **16** which in turn halt the advance of film **10**. Since there is a time interval or lag between the detection and transmission of the signal from the electric eye **28**, the color mark on film **10** will advance a distance beyond electric eye **28** before the film **10** is halted. To ensure that this distance remains the same each time the film is halted, a second electric eye **30** is positioned such that one of the color marks will come to rest in front of its lens. In the event the color mark does not come to rest in front of the electric eye **30**, a signal is transmitted calling for either a manual or automatic adjustment of the film position. To optimize control, it is recommended that a slight tension be maintained between pull rolls **14** and **16**. During proper operation, the electric eye system will cause the pull rolls to halt the advance of the tubular film **10** such that seal **24***b* is slightly above knife **36** after which clamping belts **22***a* and **22***c* move together clamping the tubular film **10** therebetween. Knife **36** then moves laterally severing the tubular film **10** to form a bag blank **40** sealed at its lower or bottom end by seal **24***a*. As may be seen in FIGS. II and III, clamp belts **22***a* and **22***b* initiate ad-

vancement of the now severed tube or bag blank 40 laterally by movement of the belts on rollers 42*a*, 42*b*, 42*c* and 42*d* which causes the edge or open top 44 of bag blank 40 which projects above belts 22*a* and 22*b* to strike projection 46 at its forward corner forcing bag top 44 to open or separate its parallel edges first at its corner and then across the entire top width of the bag as the bag is force passed and in contact with projection 46 by belts 22*a* and 22*b*. If done properly, projection 46 will cause the bag top 44 to open sufficiently to permit a filling nozzle 48 to enter for filling same, after which the opening or bag top 44 is closed by means of tape or other suitable means not shown. Although the expedient used to open the bag blank appears to be simple, the positioning or relationship between projection 46 and bag top 44 is critical. For example, unless bag top 44 projects between ½ to 1½ inches depending on the flexibility of the bag above clamp belts 22*a* and 22*b*, the top edge of the bag will not tend to open properly. To further illustrate, if the top edge projects too high above the belts, the flexibility of the thermoplastic film will caus both edges of the bag to be pushed to one side or the other without opening the bag blank. On the other hand, if the bag top does not project sufficiently above belts 22*a* and 22*b*, the bag will not open enough to permit the filling spout to enter. When the bag is opened properly by projection 46, filling spout 40 will descend between the parallel edges of the bag blank 40 forcing belt clamps 22*a* and 22*b* to part sufficiently to permit filling of the bag blank.

In the practice of the present invention, the tubular thermoplastic film material may be transversely sealed at intervals along its lengh before it is unwound, i.e., by the supplier or separate sealing operation, or the thermoplastic film material may be sealed as it is advanced through the apparatus. FIG. IV illustrates a magnified fragmentary portion illustrating a heat sealing mechanism 50 positioned in line immediately above the cutting knife 36. In the sequence of operations, when pull rolls 14 and 16 have halted the advance of film 10, heating element 52 of the heat sealing mechanism 50 moves horizontally towards film 10 pressing film 10 against back bar 54 of the heat sealing mechanism 50. The heating element 52 then fuses the layers of the tubular film together. Positioning the heat sealing mechanism 50 immediately above knife 36 has the advantage of minimizing control problems by reducing and possibly eliminating the need for the electric eye system which positions the seal. However, it is obvious that the heat sealing mechanism may be located anywhere along the line of advance of the tubular film 10 prior to the knife 36.

The invention in its broadest sense comprises transversely sealing a continuous tube of thermoplastic film along its length, transversely severing the tubular film adjacent each seal to form a bag blank sealed at one end, transferring the bag blank to a filling station where it is filled with the materials to be packaged, after which the open end of the bag blank is closed. A special expedient may be used to open the bag blank sufficiently for filling which comprises clamping the bag blank across its width ½ to 1½ inches adjacent its open end and causing a projection to move parallel and in contact with the open end of the bag.

As mentioned earlier, the thermoplastic tube may be sealed at any time prior to the tube severing operation either during a separate operation or in timed conjunction with the severing operation. Any suitable method for adhering or fusing the layers of the tube together in a line or band extending transversely and completely across the length of the tube may be used. The width of the adhered or fused line or band may vary considerably although widths of ⅛ to ⅜ of an inch are recommended for good bonding while at the same time utilizing a minimum area of seal. The preferred methods of sealing are those which cause the layers of the tubular film to fuse together. This is generally accomplished by an electric heating element although other means of obtaining the proper fusion temperature may also be used.

In the practice of this invention, the sheet is severed in conjunction with the filling operation. Consequently, the problems caused by stacking the bag blanks as described heretofore are avoided. In other words, the bag blank is transferred or conveyed to the filling station immediately after it is severed from the continuous tube. This is, in effect, an in situ bag-forming and packaging operation. Any suitable means may be used to sever the bag blank from the continuous tube such as the shuttle type knife described in FIGS. I and II, a rotary knife, guillotine type and the like. If desired, the tubing may be preperforated adjacent and parallel the seals to permit a mechanical separation instead of cutting the tube directly. It is important, however, that the tube be cut or separated parallel the line of seal immediately adjacent the advanced or forward edge of the heat seal. In this manner, a bag blank will be formed having a sealed lower end and an open upper end ready for filling.

In the illustrated embodiment, the movement of the sheet was controlled by an electric eye system. However, it is obvious that any system which will fairly accurately advance the tube predetermined distances will suffice.

A special feature of the bag forming and packaging operation are the means used to separate the parallel edges at the open end of the bag blank to permit a filling spout to enter. As described above, this is accomplished by clamping the bag across its width a predetermined distance below the open end of the bag and moving a projection parallel and in contact with the open end.

The thermoplastic tubular film can be fabricated from such plastic materials as polyethylene, polystyrene, polyethylene terephthalate, polyvinyl chloride, polyvinyl acetate, polyvinylidene chloride, polyisobutylene, polypropylene, polytetrafluoroethylene, and the like. The preferred thermoplastic film material is polyethylene, a solid, tough polymer of ethylene which can be manufactured in film form in thicknesses less than one mil. It is light in weight, extremely low in water absorption and moisture permeability, and consequently, is an excellent material for packaging uses. Layers of polyethylene can be heat sealed or fused together to present a strong bond.

The bags formed in the practice of this invention ordinarily will have substantial volumetric capacity, e.g., at least 1 cubic foot, and are designed primarily to carry about 50 to 100 pounds of such common pulverulent materials such as cement, flour, fertilizer, carbon black, chemicals and the like. The walls of the bag ordinarily will have a thickness of the order of 5 to 10 mils, although obviously the walls may be thinner or thicker as indicated by the use to which the bags are to be put. If desired, the walls of the bag can be fabricated from a plurality of plies of thick thermoplastic film.

The above descriptions and particularly the drawings are set forth for purposes of illustration only. Many variations and modifications thereof will be obvious to those skilled in the art and can be made without departing from the spirit and scope of the invention herein described.

What is claimed is:

1. A method of packaging materials in plastic bags which comprises the steps of transversely sealing a continuous tube of thermoplastic film at predetermined intervals along its length, transversely severing the tubular film adjacent each seal to form a bag blank sealed at one end, clamping the blank bag across its width adjacent the open end of the bag blank, causing a projection to move parallel to and in contact with the open end of said bag blank, whereby a filling spout may enter the bag, transferring said bag blank to a filling station,

filling said bag blank with materials to be packaged and closing said open end of the bag blank.

2. The method according to claim 1 wherein the sealing is accomplished by heat sufficient to fuse the layers of the tube of thermoplastic film together.

3. The method according to claim 1 wherein the plastic film is polyethylene.

4. A bag forming and packaging apparatus adapted to use a continuous tube of thermoplastic film which comprises, in combination, sealing means for transversely sealing the thermoplastic tube at predetermined intervals along its length, driving means for advancing the tubular film along a predetermined path, cutting means for severing the tubular film parallel and adjacent each seal forming a bag blank sealed at one end, opening means for separating the parallel edges at the open end of said bag blank comprising clamping means for clamping the bag blank across its width adjacent its open end and a projection adopted to move parallel to and in contact with the open end of the bag and conveying means for transporting said bag blank to a filling station.

5. The apparatus according to claim 4 wherein sealing means comprise heating means capable of fusing the layers of the tube of thermoplastic film together.

6. A bag forming and packaging apparatus adapted to use a continuous tube of thermoplastic film comprising, in combination, driving means for advancing the tubular film along a predetermined path, control means linked to said driving means for halting the advance of said tubular film at predetermined intervals of film travel, sealing means for transversely sealing the thermoplastic tube while said film is stationary, cutting means for severing the tubular film parallel and in front of its forwardmost seal to form a bag blank sealed at one end while said film is stationary, conveying means adapted (1) to clamp said bag blank across its width adjacent the open end of said bag blank and (2) to force the open end of said bag blank against a projection to separate the parallel edges at the open end of said bag blank, a filling spout adapted to enter between said separated edges to permit materials to fill said bag blank and closing means for sealing the open end of the filled bag blank.

7. A bag forming and packaging apparatus adapted to use a continuous tube of thermoplastic film which comprises, in combination, sealing means for transversely sealing the thermoplastic tube at predetermined intervals along its length, driving means for advancing the tubular film along a predetermined path, cutting means for severing the tubular film parallel and adjacent each seal forming a bag blank sealed at one end, projection means for separating the parallel edges at the open end of said bag blank and conveying means for transporting said bag blank to a filling station.

8. A bag forming and packaging apparatus adapted to use a continuous tube of thermoplastic film which comprises, in combination, sealing means for transversely sealing the thermoplastic tube at predetermined intervals along its length, driving means for advancing the tubular film along a predetermined path, cutting means for severing the tubular film parallel and adjacent each seal forming a bag blank heat sealed at one end, projection means for separating the parallel edges at the open end of said bag blank, conveying means for transporting said bag blank to a filling station, filling means for charging the materials to be packaged into said bag blank, and closing means for sealing the open end of said charged bag blank.

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