Sept. 20, 1966 L. D. COOK 3,273,775

APPARATUS FOR FEEDING THIN FILM TO CUTTING KNIVES

Filed Dec. 2, 1964 4 Sheets-Sheet 1

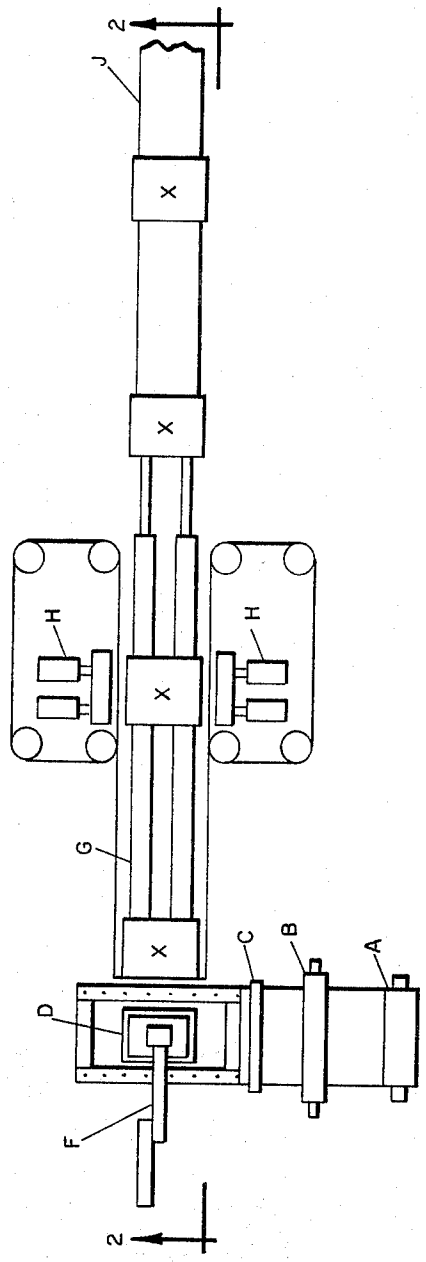



FIG. 1

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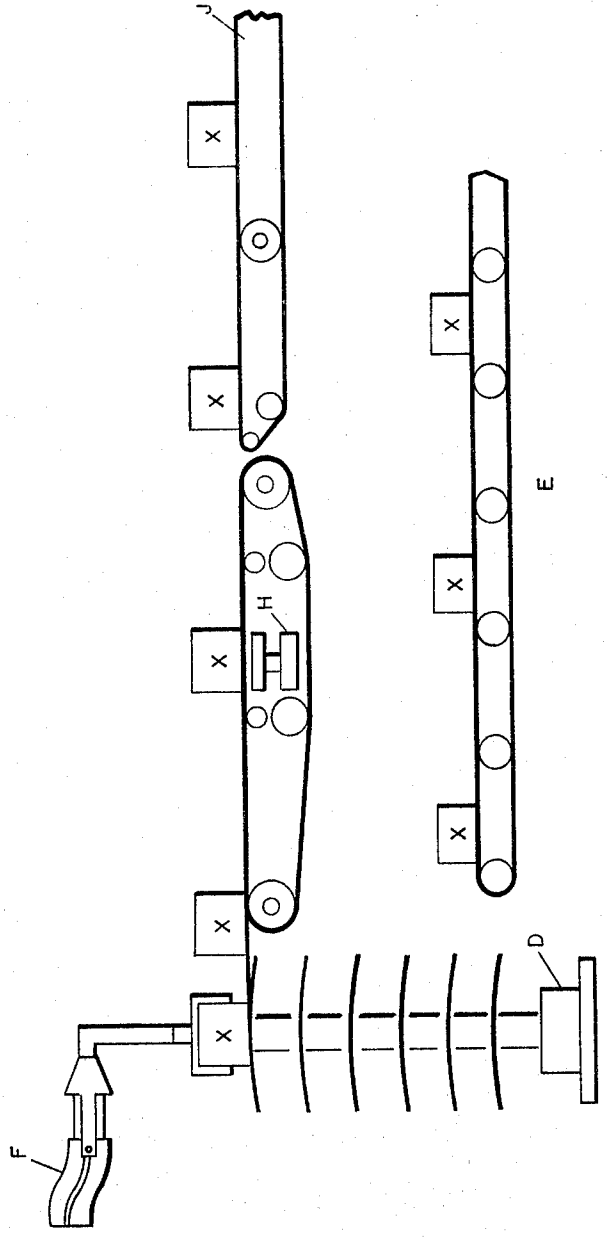



FIG. 2

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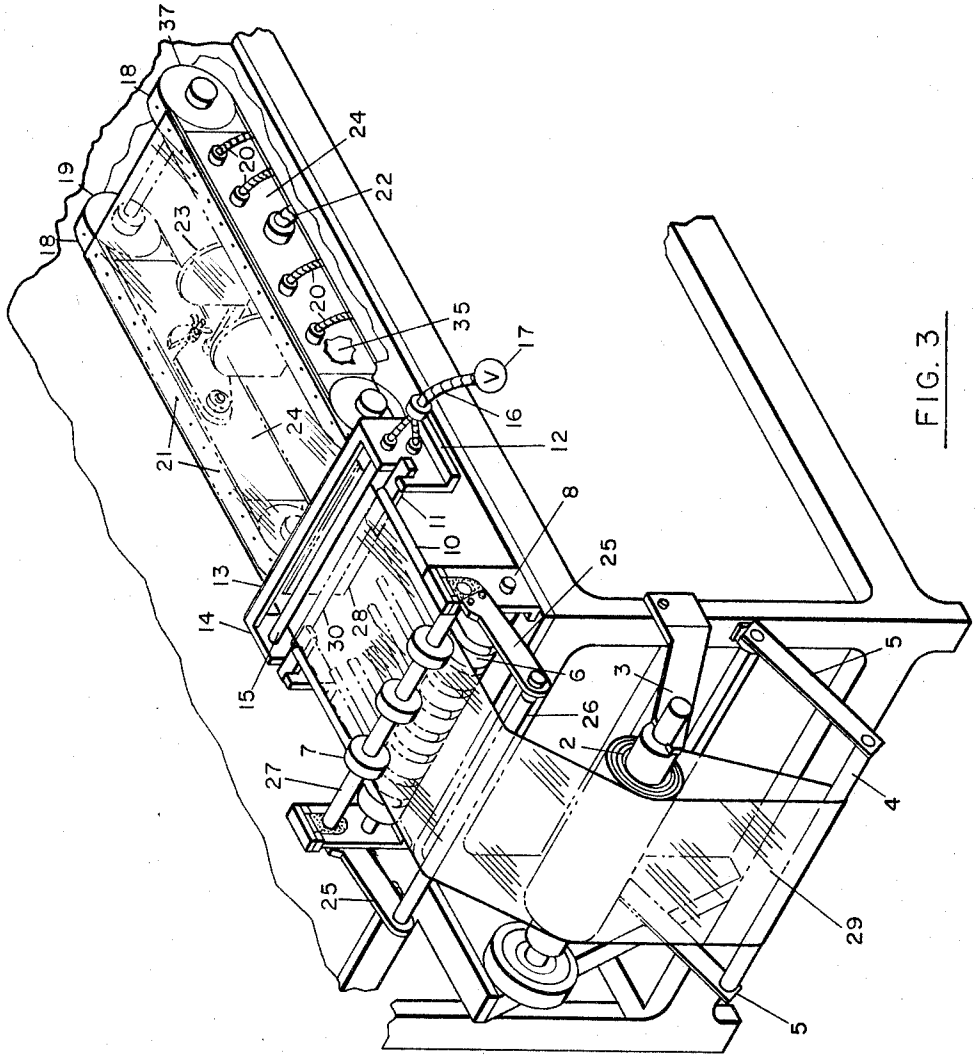



FIG. 3

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APPARATUS FOR FEEDING THIN FILM TO CUTTING KNIVES

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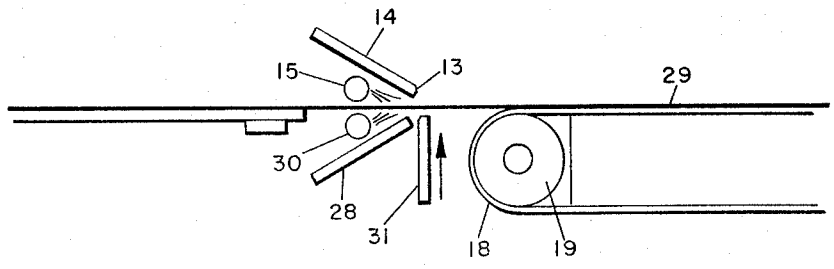



FIG. 4

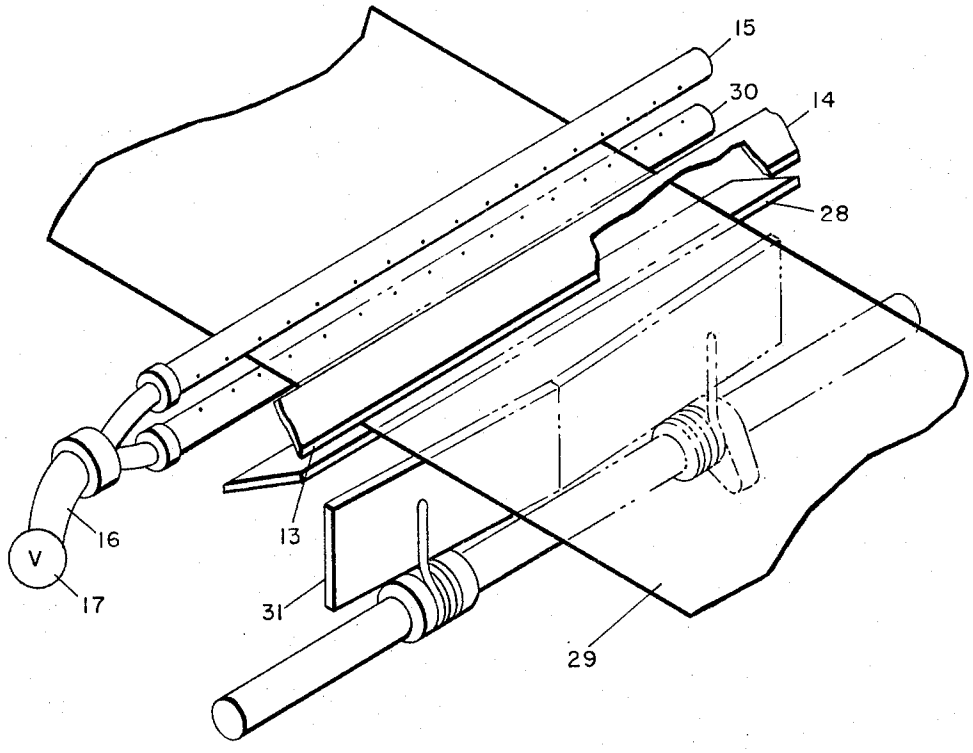



FIG. 5

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United States Patent Office 3,273,775 Patented Sept. 20, 1966



3,273,775

# APPARATUS FOR FEEDING THIN FILM TO CUTTING KNIVES

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1 Claim. (Cl. 226—97)

This invention relates to apparatus for the feeding of synthetic fiilm to a package wrapping machine. More specificaily, it relates to an improvement in film conveying apparatus which facilitates the feeding of limp film to a cutting station for reduction to the required size.

Continuous, automatically operating, synchronized package wrapping machines are known whereby a continuous flow of items to be wrapped is supplied from one source and individual sheets of wrapping material are supplied from another source to a wrapping station where the wrapping material is mechanically folded about the items and sealed. Many such machines are adapted to produce the individual sheets of wrapping material of the required size by severing the same from a supply roll in an operation synchronized with the wrapping process. An example of such a machine is that shown in U.S. Patent 2,853,841 or that shown collectively in U.S. 2,299,984 and U.S. 2,300,569.

The package wrapping machines which are generally available on the market today and which are currently in the widest use are designed to operate with relatively stiff wrapping material. The most common such wrapping materials are regenerated cellulose (cellophane) and paper. When one attempts to operate the known package wrapping machines with a film such as thin gauge, biaxially oriented polypropylene, difficulties in feeding the film to the cutting station are encountered due to its limpness. This limpness makes it difficult or even impossible for the film to bridge the gap which necessarily exists between the food rolls and the cutting knives. Whereas stiff film can readily be pushed through this gap, the limp film tends to sag under its own weight in even the smallest gap before it reaches the knives.

It is the object of this invention to provide appartus for supporting and conveying limp film in the area between the feed rolls and the cutting knives of a package wrapping machine of the type previously described.

The invention and the prior art will be explained with reference to the attached drawings in which:

FIG. 1 and 2 are schematic drawings showing the arrangement of film feeding and wrapping apparatus in a typical wrapping machine.

FIG. 3. is a diagrammatic representation in perspective of a film feeding apparatus adapted for use with a continuous synchronized package wrapping machine.

FIG. 4 is a section view of the film conveying and supporting apparatus of this invention.

FIG. 5 is a perspective view of the film conveying and supporting apparatus of this invention.

In a typical package wrapping machine arrangement as shown in FIGS. 1 and 2, a continuous web of the packaging material is fed from a supply A by means of a pair of feed rolls B to a set of knives C, the feed rolls stop and a sheet of the required size is severed from the web. As the sheet is severed, it is in position directly above an elevator D which periodically receives an item to be wrapped, X, delivered thereto by a conveyor, E. As the sheet of wrapping material is servered, the elevator with the item resting thereon rises to contact the sheet. By a series of mechanical operations, the wrapping operation is commenced while the item is still resting on the elevator, following which it is pushed off the elevator by pusher F to another conveyor G which carries it through



the remainder of the wrapping operation, then to heat sealing means H and from there take-off conveyor J carries it to further operations such as e.g., crating, shipping, etc. When the wrapped item has been removed from the elevator, the elevator descends once more to receive another item, the feed rolls are activated to deliver another length of the wrapping material and the entire cycle starts again. The operation of the machine, from wrapping material feed, to elevator operation, and on through activation of the heat sealing means is synchronized by means of a series of interdependent cams and microswitches.

The film feeding arrangement shown in FIG. 3 comprises a main supporting frame **1**, a film supply roll **2**, supported by a bracket **3**, a film tensioning idler **4** with mounting arms **5**, a film guide idler **26** and stationary mounting arms **25**, a film feed roll **6**, pressure rolls **7**, mounted on shaft **27**, feed and pressure roll support member **8**, a plurality of film support rods **10**, and associated retaining member **11**, an upper film cutting blade **13**, upper and lower air deflector plates **14** and **28** respectively, upper and lower air supply pipes **15** and **30**, respectively, air supply line **16**, having a valve **17** therein, and supporting frame **12** for the air tubes and deflector plates. Beyond the cutting blade **13** are found vacuum belts **18**, with associated drive pulleys **19**, and vacuum chamber **24** with suction lines **20** and pressure line **22**. Numeral **23** represents a package delivery elevator.

The film supporting and conveying apparatus of this invention shown in detail in FIGS. 4 and 5 comprises upper and lower perforated air pipes **15** and **30** respectively, upper and lower air deflector plates **14** and **28** respectively, disposed at an angle relative to each other, and an air supply line **16** containing a valve **17** for interrupting the air supply as required. Numeral **31** represents the lower cutting knife which forms no part of this invention.

In operation, film **29** is fed from roll **2**, around tensioning idler **4**, over guide idler **26** and into the nip between feed roll **6** and pressure roll **7**. Driving force for this film feed is supplied by the drawn feed roll **6**. As film is drawn between feed roll **6** and pressure roll **7**, the tensioning idler **4** is raised, releasing a brake on roll **2**, and permitting the film to be reeled off.

Pressure roll **7** is made of a resilient material such as rubber and is mounted in contact with feed roll **6**. As the film enters into the nip between these rolls it is positively gripped thereby and advanced onto the film support rods **10**. The feed roll is driven by an electric motor or other standard drive means (not shown) and its operation is synchronized with that of the remainder of the machine by the main synchronizing cam system. The pressure roll, which can be either a series of roll segments mounted on the shaft **27** as shown in FIG. 4 or a single roll coextensive in length with the metal feed roll, is driven by the rotation of the feed roll.

As the film travels through the nip of the feed and pressure rolls, it comes in contact with the surface of the film support rods **10** and is moved along this surface to a point close to the cutting knives **13**.

As the advancing film nears the end of the film support rods **10**, it comes under the influence of a venturi effect created by air blowing from air pipes **15** and **30** against deflector plates **14** and **28** and escaping through a relatively narrow opening between the leading edges of plates **14** and **28**. The venturi effect of air passing through this narrow opening creates a slight standing wave in the film and supports the film as it passes through this narrow gap, through the knives and beyond into contact with vacuum belt **18**.

Vacuum belts **18** are continuous belts having a plurality of perforations in their surface and which revolve

about pulley 19. The perforations communicate with the interior of hollow vacuum chamber 24. The film is gripped by the belts because of a vacuum created within chamber 24 by suction through vacuum lines 20. The gripping of the film by the vacuum belts after its leading edge has passed the knives also assists in forwarding the film from the feed roll to the cutting area.

When the predetermined length of film has been advanced into position beyond the cutting knives, the advancement of the film is automatically stopped by the synchronizing cam system mentioned previously which causes the power to the feed rolls to be shut off. Simultaneously, the air supply to the air pipes 15 and 30 is shut off by automatic synchronized closing of valve 17 and the cutting knives are actuated to sever a single sheet of predetermined length from the advancing film. As soon as the cutting operation has been accomplished, air flow to the pipes is resumed in order to support the now unsupported leading edge of the film.

The severed sheet of film is positioned directly above the elevator 23 which is now actuated to rise to meet the wrapping film. As soon as the rising elevator contacts the film, the vacuum holding the film on the belts is broken and a positive pressure is created within the vacuum chamber by admitting air thereto through air pressure line 22. The positive pressure within the chamber permits the film to be removed from the belts uniformly.

When the severed sheet of film has been removed from the belts, the feed roll is actuated, suction is resumed on the belts, and the entire cycle is repeated.

Ordinarily it is not possible to position the film cutting knives and the take-off belts sufficiently close to the feed roll that there will not be at least a small unsupported area between the knives and the roll where the film would be required to support its own weight, and where a limp film would sag. When the film support rods are installed into their mating grooves on the metal feed roll with their surfaces essentially flush with the upper surface of the feed roll, a continuous surface is created to support the film from the feed roll to a point substantially adjacent to the cutting knives. From this point, however, to the take-off belts no tangible support means can be employed for the film due to the presence of the cutting knives. The air pipes and deflector plates of this invention fulfill the need for support of the film in this area. The air passing between the deflector plates creates a cushion of air of substantially identical pressure on each surface of the film which affords the required support to prevent sagging. The venturi effect created by the air passing between the plates also supplies a degree of suction to assist in forwarding the film through this area. Thus, the film is supported throughout the entire area from the feed rolls until it passes beyond the cutting knives and onto the take-off belts. There is now no possibility for the film to sag anywhere in this area. Thus, the arrangement is useful with film of even the thinnest gauge.

In the embodiment of the invention shown in the drawings, the upper air deflector plate also serves as the upper cutting blade. This is not to be construed as a limitation on the invention. These members can also be separate.



The perforated air pipes and deflector plates of the invention are substantially equal in length to the width of the film. The diameter of the pipes can be varied through a relatively wide range; a typical diameter is ¼ inch. The perforations are spaced at intervals across the pipes and can vary in size; a typical arrangement is for 0.015 inch diameter—holes to be spaced on ¾ inch centers. The diameter of the pipes and the number and size of the perforations and the relationship between these parameters is determined by the gauge of the film to be processed and by the linear rate at which the film is expected to travel through the machine.

The air deflector plates are installed at an angle relative to each other such that a relatively small gap, typically about ¼ inch, is left between the leading edges thereof. The width of this gap can be varied to suit varying operational requirements such as gauge of the film, operating speed, etc. The angle of the plates relative to each other can likewise be varied to suit operating requirements, but will normally be between 0° and 45° from horizontal.

As stated, valve 17 is provided in the air supply line to the pipes to interrupt the air flow as required. This valve is automatically actuated to cut off the air supply when the cutting knives are actuated to sever the film. Discontinuation of the air flow during the severing operation is necessary to prevent film flutter around the cutting area. As can readily be seen there is already sufficient support for the film during this period since the film has spanned the gap and is resting on the support rods on one end and on the vacuum belts on the other. Immediately upon severance of the sheet, however, support is required for the leading edge of the remaining film and air flow to the pipes is resumed.

What I claim and desire to protect by Letters Patent is:

Apparatus for feeding a film through a set of cutting knives which comprises an upper perforated air pipe having a deflector plate associated therewith, a lower perforated air pipe having a deflector plate associated therewith, said upper and lower deflector plate being mounted at an angle relative to each other, with a small gap therebetween and said perforated air pipes being mounted with perforations positioned to project air onto the deflector plates, whereby a venturi effect is created between the plates, means for supplying air to said perforated pipes, and means for interrupting the flow of air from the perforated pipes at predetermined intervals.


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