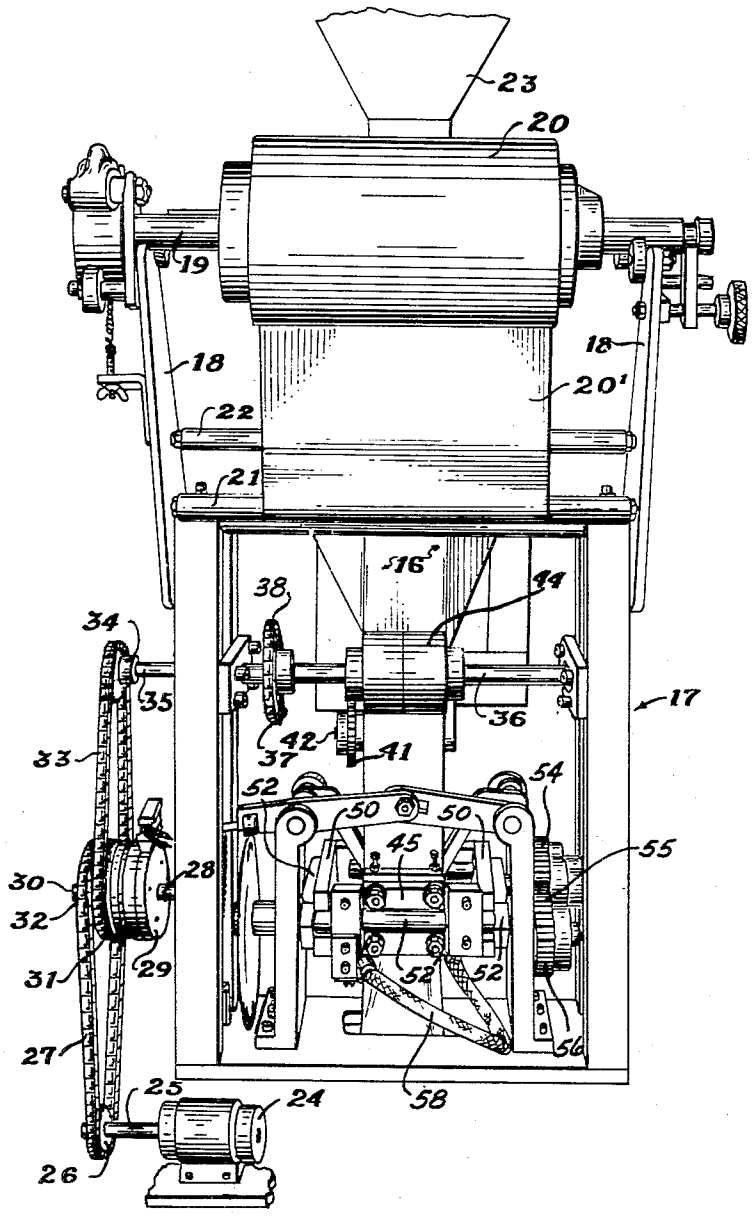
Aug. 30, 1960 A. P. GAUSMAN 2,950,588

AUTOMATIC PACKAGING MACHINES

Filed Dec. 24, 1958 5 Sheets-Sheet 1

Fig. 1.



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AUTOMATIC PACKAGING MACHINES

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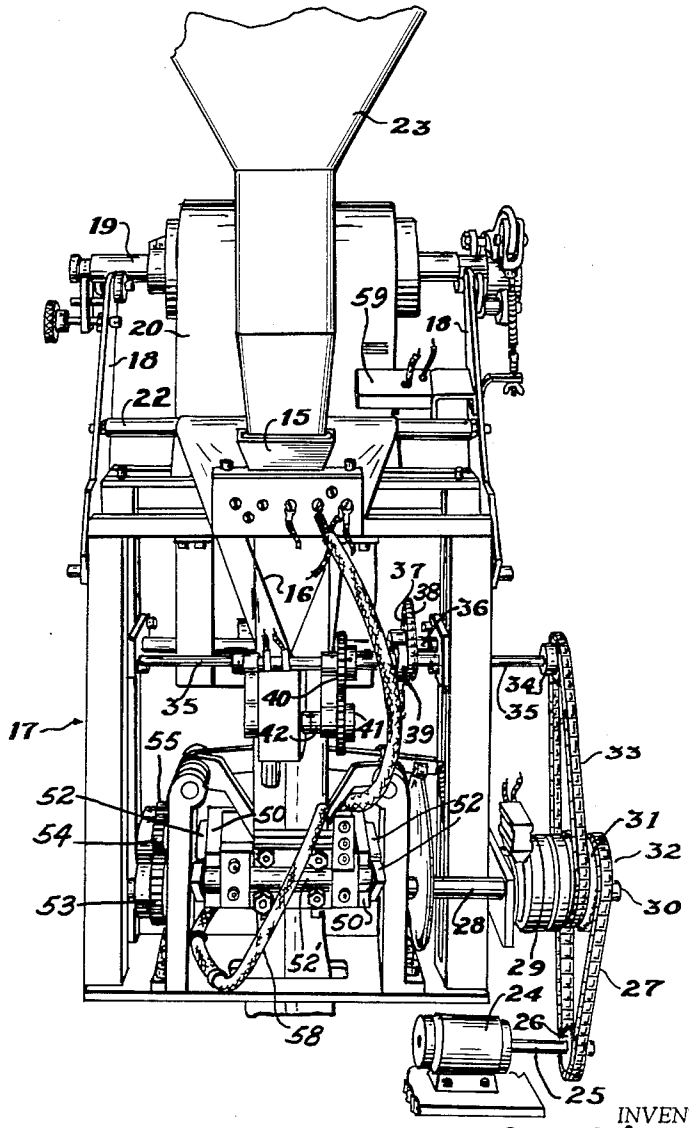
Fig. 2.



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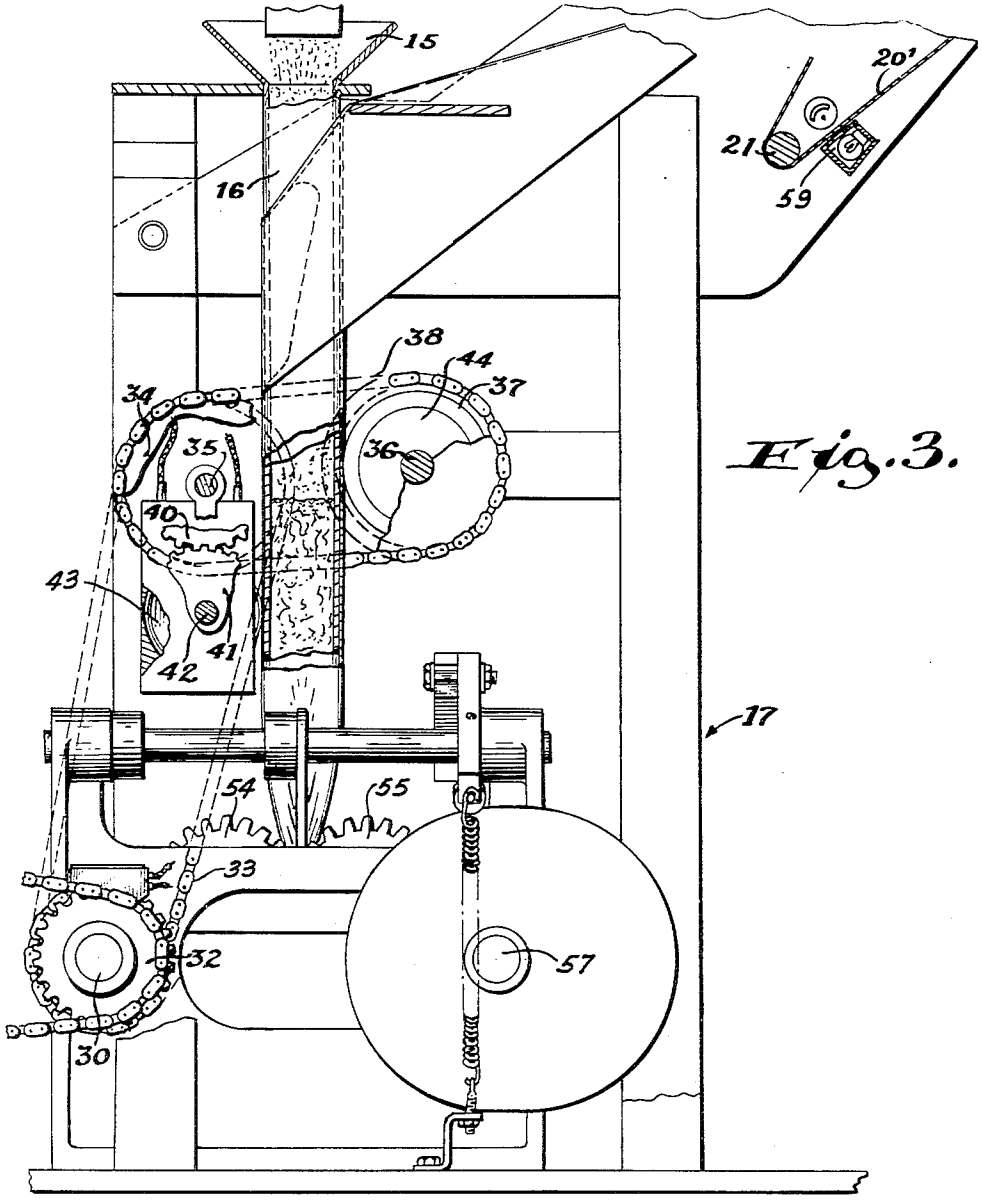

Fig. 3.

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AUTOMATIC PACKAGING MACHINES

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Fig. 4.

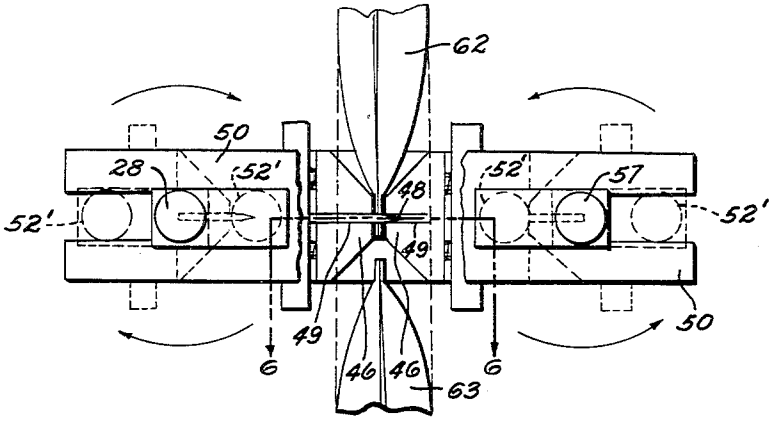

Fig. 5.

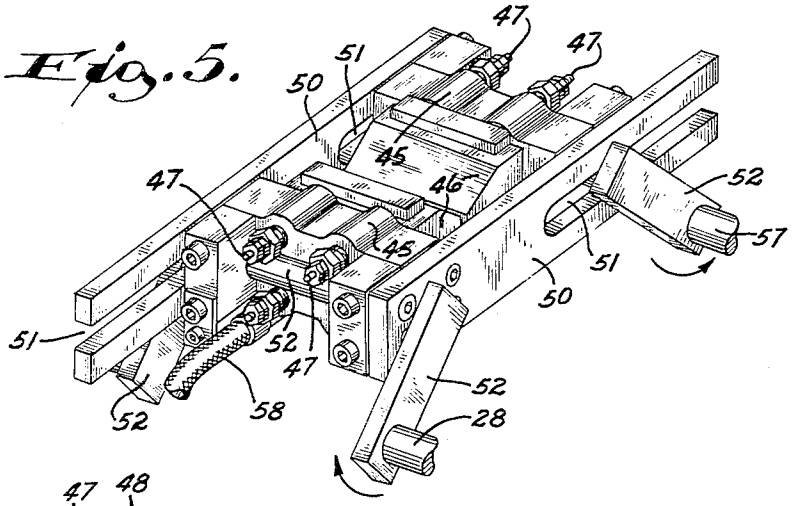

Fig. 6.

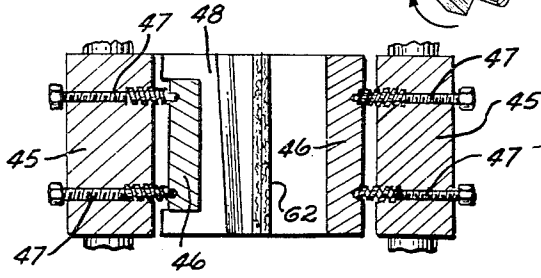

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Fig. 7.

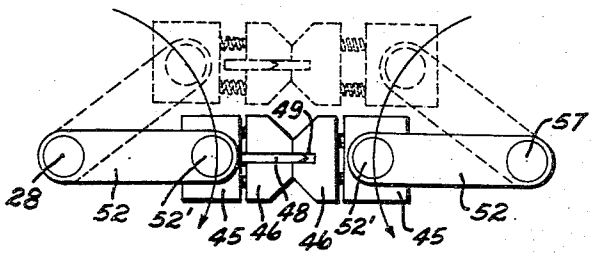


Fig. 8.

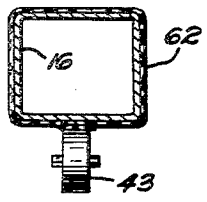


Fig. 9.

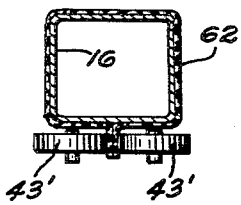


Fig. 11.

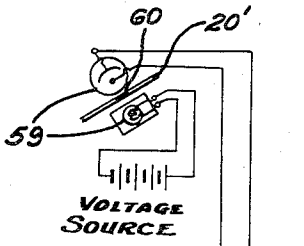
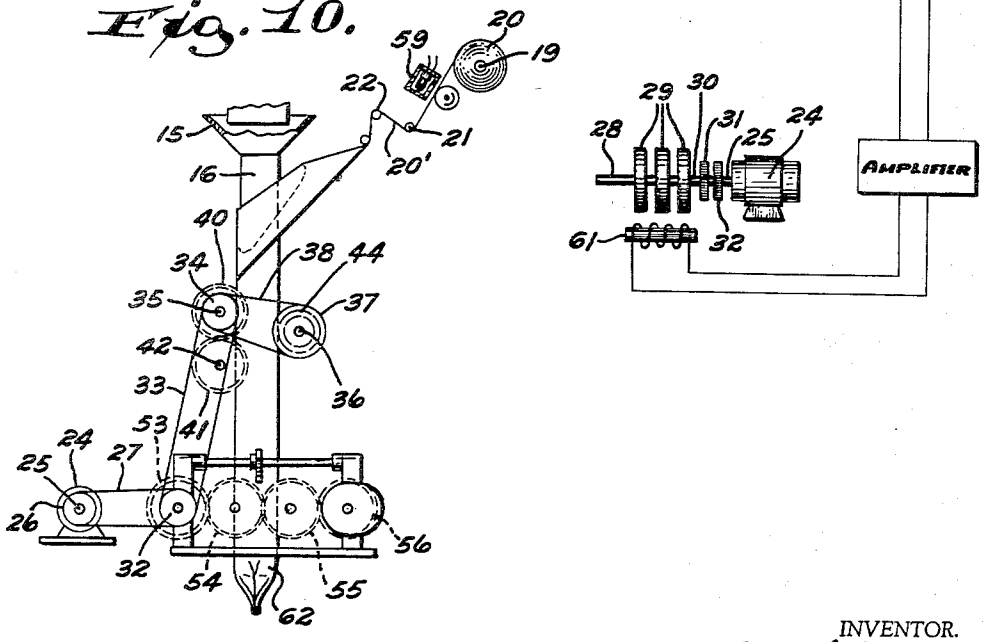


Fig. 10.



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2,950,588

AUTOMATIC PACKAGING MACHINES

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Filed Dec. 24, 1958, Ser. No. 782,749

10 Claims. (Cl. 53—51)

This invention relates to improvements in automatic packaging machines, and more particularly to a continuous motion high-speed automatic packaging machine.

It is conventional in the industry to provide automatic packaging machines for merchandise or commodities of various types and in such machines the individual articles to be packaged, or carefully measured predetermined amounts of the commodity, are automatically fed into a succession of formed packages. The machines form what may be termed a package or tube from a strip of suitable flexible packaging material, preferably a thermoplastic web material, and the bottom of each bag or package, while still attached to the strip, is closed to prevent escape of the product fed thereinto for packaging. The bag or package, which is formed with a longitudinal seal while in the machine, is subsequently sealed at its top portion and detached from the strip of package-forming material and is delivered from the machine containing the article or a predetermined amount of the packaged product, the completed package being fully sealed.

Machines of the general type above described have been on the market for some time, but the various types of such machines have certain limitations. In many of the known machines of this type the transverse sealing jaws operate to intermittently pull the web and thus advance it, which restricts the speed of operation of the machine.

With the above in mind, it is a primary object of the present invention to provide a continuous motion automatic packaging machine wherein the web material from a supply roll is pushed through the web folding mechanism to form a tube by a continuously operating feed roller, which results in a high degree of speed in the operation of the machine and in the automatic production of a succession of filled and sealed packages.

A further object of the invention is to provide a high-speed automatic packaging machine wherein the length of the packages to be formed can be controlled or determined by a photoelectric cell mechanism and the speed of operation of the machine is determined by the speed of rotation of the film feed roller.

A further object of the invention is to provide a high-speed automatic packaging machine of the character described wherein correct registry will be maintained for packages having printed matter or delineations borne by the web material therefor.

A further object of the invention is to provide a high-speed automatic packaging machine which can be used with any of the conventional feed devices, such as volumetric feeds, net weight scale feeds, auger feeds, liquid feeds and unit counting devices.

A further object of the invention is to provide an automatic packaging machine of the character described which is of relatively small and compact size.

A further object of the invention is to provide, in a high-speed automatic packaging machine, transverse sealing dies with knife means incorporated therein which

seal the top portion of a lowermost bag and the bottom portion of the bag being formed thereabove followed by a severance of the sealed lowermost bag from the tubular column, all in one cycle of operation.

A further object of the invention is to provide a high-speed automatic packaging machine which is adaptable to products of various types, which rapidly produces a succession of properly filled, constructed and sealed flexible bags or packages containing a desired amount of the commodity to be packaged, and which is well adapted for the purposes described.

With the above and other objects in view, the invention consists of the improved automatic packaging machine, and its parts and combinations as set forth in the claims, and all equivalents thereof.

In the accompanying drawings, in which the same reference characters indicate the same parts in all of the views:

Fig. 1 is a front view of the improved automatic high-speed packaging machine;

Fig. 2 is a rear view thereof;

Fig. 3 is an enlarged side view with parts broken away and in section;

Fig. 4 is an enlarged fragmentary detailed view showing the end sealing dies in their operative position with the cut-off knife carried thereby, the sealing dies being crank-operated;

Fig. 5 is a fragmentary perspective view of the crank-operated end sealing dies;

Fig. 6 is an enlarged detail sectional view taken on line 6—6 of Fig. 4 showing the retracted position of the cut-off knife;

Fig. 7 is a semi-schematic view showing the end sealers in sealing position with the cut-off knife operating through the contact portion of the sealing cycle;

Fig. 8 is an enlarged fragmentary detail sectional view showing the principal form of the longitudinal tube seam-forming mechanism;

Fig. 9 is a similar fragmentary transverse detail sectional view showing an alternative mechanism for forming the longitudinal seams in the tubes or packages;

Fig. 10 is a schematic view of the driving mechanism for the improved automatic packaging machine wherein the length of the package is determined by the operation of a photo electric cell mechanism; and

Fig. 11 is a schematic showing and wiring diagram of the electric clutch brake drive mechanism for end sealing as controlled by a photo electric cell mechanism.

Referring now more particularly to Figs. 1, 2 and 3 of the drawings, it will appear that the same illustrate one embodiment of an automatic high-speed packaging machine equipped with the present improvements. At the upper portion of the base of the machine there is a funnel 15 (see Figs. 2 and 3) which communicates with and feeds into a forming tube 16 on which bags or packages are being formed. The particular type of feeding device for the commodity to be packaged has not been illustrated, but it should be understood that the head of the machine may be equipped with a net weight scale feed, an auger feed, a volumetric feed, a liquid feed, or other devices for measuring and delivering a predetermined quantity of a product to be packaged, and the present machine is adapted to handle any commodity whether it be powdery, flaky, liquid or globular. As is conventional, the material to be packaged is supplied from a source into the particular type of feeding device with which the machine is equipped, and from the latter a predetermined amount of the commodity reaches the forming tube 16 via a funnel 23 or other conventional means, as a tube in the case of liquids. As will appear hereinafter, the bags or packages are in the process of being formed below the head of the machine and when

a bag or package being formed is in proper condition to receive its measured batch of a commodity the same is allowed to gravitate through the funnel **15** and downwardly through the forming tube **16** on which the bags or packages are being formed.

The present automatic high-speed packaging machine is adapted for use with any suitable type of available flexible packaging material having thermoplastic properties and which is susceptible of heat sealing as, for instance, cellophane, glassein, pouch papers, and laminated materials.

The frame of the improved automatic high-speed packaging machine, designated generally by the numeral **17**, supports at its upper end a pair of upwardly angularly directed arms **18**. At the upper ends of said arms **18** bearings are provided which rotatably engage opposite end portions of a shaft **19** which carries a roll **20** of the flexible thermoplastic film or web material being used for packaging, and the material from the roll is extended downwardly in the form of the web **20'**. The web material **20'** is engaged by several guide rollers **21** and **22** and extends over a conventional folding bar from whence the web of sheet material engages and is wrapped around the forming tube **16** on which it is folded and arranged in tubular formation, as is common in automatic packaging machines which form tubes from flexible web material.

Referring to Figs. 1, 2 and 3 of the drawings, it will appear that power for the operation of the entire machine is derived from an electric motor **24** whose driven shaft **25** carries fast thereon a sprocket **26** engaged by an endless chain **27**. Journaled horizontally in the lower portion of the machine frame **17** is an end seal die shaft **28** which is split at its outer end and carries an electric clutch brake **29**. A split or stub shaft portion **30** which also extends to the clutch brake **29** has fast thereon spaced-apart sprockets **31** and **32**. The sprocket **32** is drivingly engaged by the endless chain **27** and the companion sprocket **31** on the stub shaft **30** is engaged by an endless chain **33**. The chain **33** drives a sprocket **34** fast on the outer end portion of a seam seal wheel drive shaft **35**. The numeral **36** (see Fig. 1) designates a paper feed roll shaft which carries a sprocket **37** driven by a chain **38** which also engages a sprocket **39** which is on the shaft **35** and rearwardly of the sprocket **34** with reference to Figs. 1 and 3. Fast on the shaft **35** and driven thereby is a gear **40** which is in mesh with another gear **41** fast on a sealing roller shaft **42**. Also fast on the shaft **42** is a longitudinal seam seal applying wheel **43** (see Fig. 3) which is housed within a heated casing.

Through the drive above described it will appear that the shaft **36** is constantly driven from the electric motor **24** and said shaft **36** carries a web feed roller **44** which is preferably formed of rubber or a similar resilient material. When the machine is in operation the constantly driven web feed roller **44** contacts an extent of the web material **20'** and pushes it downwardly along the forming tube **16** toward the sealing jaws.

The complementary end seal die mechanism is shown in detail in the perspective view of Fig. 5 and is also shown in Fig. 4. The numerals **45** indicate the complementary die bodies of said assemblage and said die bodies have adjacent die faces **46**. The die faces **46** are yieldingly movably carried by the die bodies by spring loaded studs **47**. One of the die faces carries a knife **48** which is accommodated by recesses **49** in both of the die faces so that the knife may be projected transversely across the film material for severing endwise adjacent bags or packages. The opposite sides of the die body are secured to horizontal slides **50** which are formed with slots **51** therein. Extending transversely through an end portion of each die body is the portion **52'** of a crank **52** with each crank portion **52'** being journaled in suitable bearings with the free end of each crank portion **52'** being engageable in a slot **51** of a slide bar **50**.

An outer end portion of one of the cranks **52** is fast on and derives its motion from the shaft **28**. Fast on the shaft **28** to be driven thereby is a gear **53** which is in mesh with a companion gear **54** and gear **54** meshes with gear **55**, which in turn meshes with gear **56**. Gear **56** is fast on a shaft **57** which is secured to and drives a companion crank **52** (see Fig. 5). The result of the drive described is that through the various cranks **52**, deriving motion from the control shaft **28**, the entire assemblage of Fig. 5 is driven through an up and down orbital path and at the same time the die bodies and die faces move toward and away from each other in horizontal paths, being guided by the slots **51** in the slide bars **50**. The movement imparted to the dies is such that during the orbital travel of the assemblage of Fig. 5 the die faces will come together at the elevated position shown in broken lines in Fig. 7, at which time they will engage therebetween the film material forming the bottom of one bag and the top of a bag therebelow, and then the contacting dies will move vertically downwardly from the dotted line position of Fig. 7 through the full line position of said Fig. 7 and therebelow. During this period the spring-loaded die faces are effective to project the knife **48** through the film material engaged by the die faces to sever it, thereby separating a lower bag from the bag immediately thereabove. The die faces **46**, as is conventional, are electrically heated and are controlled by conventional thermostats. Electricity is conducted to the heaters (not shown) in the die faces by a cable **58** connected with a suitable source of electricity.

It will therefore be understood that when the electric motor **24** is in operation, through the driving mechanisms previously described, the film feed rollers **44** are constantly driven at a constant speed to push the film material **20'** downwardly along the forming tube **16** and toward the end seal die mechanism.

The apparatus of the present invention is preferably equipped with a photoelectric cell mechanism **59** whose beam is interrupted by a spot **60** (see Fig. 11) or other marking on the web of film material **20'** passing therethrough. The actuation of the electric eye mechanism **59** by the spot **60** on the film material **20'** energizes a relay **61** which actuates the electric clutch **29**, thereby causing, through the mechanism previously described, the cycling of the end seal die assemblage of Fig. 5 through one complete orbital path of travel to cause end sealing of the adjacent packages and severance of the lowermost package from the package thereabove, through reciprocation of the knife **48**. The bag length is determined by the operation of the photoelectric cell and the corresponding markings on the film material being used for the packaging. The vertical speed of movement of the die faces **46** while they are in contact as shown in Fig. 7 is identical to the rim speed of the paper film feed roller **44**.

Referring to Fig. 4, a filled and completed bag which has been end sealed and severed from the bag **62** thereabove is indicated by the numeral **63**. While the film material is wrapped around the forming tube **16** in the process of being formed into a bag **62**, in addition to the end sealing previously described, it is necessary that the film material supported on the forming tube **16** be given a longitudinal seal, as is common in the art. The principal arrangement for longitudinal sealing is shown in Fig. 8, wherein the margins of the film material directed about the forming tube **16** overlap and are engaged by the driven wheel **43** which is heated so as to form a heat seal longitudinally of the material. In Fig. 9 an alternative arrangement for forming the longitudinal seam is illustrated, wherein the margins of the material about the forming tube **16** are brought outwardly in abutment in the form of a fin, and the fin is run between a pair of companion driven heated rollers **43'**.

From the preceding description it will be apparent that the improved automatic packaging machine is powered by the electric motor **24** and through the positive drive

to the feed roller shaft 36, the feed rollers 44 are continuously driven at a constant rate of speed to push the film material extended from the roll 20 down along the forming tube 16 to be formed into successive bags, which are filled with a predetermined amount of the commodity being packaged.

Conventional automatic packaging machines depend upon the end sealing jaws to intermittently clamp and engage the tube of flexible packaging material and to advance it a desired length, and the advance movement imparted to the end sealing jaws when they are in engagement with the tube determines the length of the package. In addition to the limitation in speed of operation, when it is desired to run packages of different lengths, it is necessary in said conventional machines, to readjust the mechanism in the machine in order to obtain the re-established new length of stroke of the gripping sealing jaws.

As opposed to the aforesaid arrangement in conventional automatic packaging machines, the apparatus of the present invention, in which the web of film material is being constantly advanced, the package length is determined solely by the timing of the cycling operation of the end seal die assemblage for forming the end seals and severing adjacent packages, and this time of cycling is conveniently controlled by the photoelectric cell mechanism in conjunction with properly spaced markings on the web of film material passing through the beam of the photoelectric cell. Consequently, in the apparatus of the present invention, if it is desired to run a succession of bags or packages of different lengths, it is only necessary to change the roll of film material on the shaft 19 which, having differently spaced markings thereon, will, through the photoelectric cell mechanism, cause a different timing in the operation of the end seal jaw assemblage to provide different package lengths, without any necessity for readjusting any portion of the packaging machine mechanism.

By virtue of the continuous operation of the feed rollers 44 which advance the film material by pushing it, the speed of the machine is far in excess of the speed of the conventional automatic packaging machines which advance the film material only intermittently by pulls exerted by the end seal dies.

The elimination, in the improved automatic packaging machine, of mechanism such as end seal dies which operates through an extended vertical path of travel for advancing the tube of film material, permits the present machine to be very compact and of considerably less height than standard machines.

The improved automatic packaging machine is rapid and highly efficient in operation, is very flexible in use, is relatively inexpensive to manufacture, and is well adapted for the purposes set forth.

What is claimed as the invention is:

1. In an automatic packaging machine, a former about which a continuous web of thermoplastic sheet material drawn from a roll is formed into a continuous tube, driven means mounted adjacent the inner end portion of the former for continuously pushing the web of thermoplastic material along said former, transverse heat sealing dies having a transverse cut-off knife incorporated therein, means for closing the heat sealing dies to form transverse heat seals in the advancing tube and to sever an advanced section of the tube from the tube portion thereadjacent, the dies, when closed upon the tube, advancing with the tube at the same rate of speed, means for opening said heat sealing dies while the tube is advancing on the former, and means controlled by the advance movement of the web of sheet material for automatically intermittently closing and opening the dies relative to the continuously advancing tube to determine the package lengths.

2. In an automatic packaging machine, a former about which a continuous web of thermoplastic sheet material drawn from a roll is formed into a continuous tube, driven means for continuously pushing the web of thermoplastic material along said former, transverse heat sealing dies having a transverse cut-off knife incorporated therein, means for closing the heat sealing dies and advancing the same with the tube to form transverse heat seals in the advancing tube and to sever an advanced section of the tube from the tube portion thereadjacent, means for opening said heat sealing dies while the tube is advancing on the former, and photoelectric cell means actuated by the advance movement of the web of sheet material thereadjacent for automatically intermittently controlling the closing and opening of the dies relative to the continuously advancing tube.

3. In an automatic packaging machine, a former about which a continuous web of thermoplastic sheet material drawn from a roll is formed into a tube, power means for continuously pushing the web of thermoplastic material along said former, transverse heat sealing dies, electric clutch controlled means for closing the heat sealing dies to form transverse heat seals in the tube to define therein a succession of packages, electric clutch controlled means for opening said heat sealing dies while the tube is advancing on the former, said dies, when closed, advancing with the tube at its rate of speed, and means for causing the operation of said electric clutch controlled die opening and closing means at intervals equal to predetermined lengths of sections of the web of sheet material including an electric eye responsive to markings on the web material.

4. In an automatic packaging machine, a former about which a continuous web of thermoplastic sheet material drawn from a roll is formed into a tube, power means for continuously pushing the web of thermoplastic material along said former, transverse heat sealing dies, electric clutch controlled means for closing the heat sealing dies to form transverse heat seals in the tube to define therein a succession of packages, electric clutch controlled means for opening said heat sealing dies while the tube is advancing on the former, said heat sealing dies including means for severing the tube intermediate the heat sealed zone across the entire tube to leave a sealed end on the package preceding the heat sealing dies and on the package trailing the heat sealing dies, said dies advancing with the tube when closed, and means for causing the operation of said electric clutch controlled die opening and closing means at intervals equal to predetermined lengths of sections of the web of sheet material including an electric eye responsive to markings on the web material.

5. In an automatic packaging machine, a vertical former about which a continuous web of thermoplastic sheet material drawn from a roll is formed into a continuous tube, driven means mounted adjacent the upper end of the former for continuously pushing the web of thermoplastic material downwardly along said former, transverse heat sealing dies having a transverse cut-off knife incorporated therein, means for closing the heat sealing dies to form transverse heat seals in the advancing tube and to sever an advanced section of the tube from the tube portion thereadjacent, said dies advancing with the tube when closed, means for opening said heat sealing dies while the tube is advancing on the former, means for intermittently moving said dies through an orbital path in a vertical plane while they are going through their opening and closing cycle, and means for automatically controlling the intermittent cycling of the dies relative to the continuously advancing tube.

6. In an automatic packaging machine, a vertical former about which a continuous web of thermoplastic sheet material is formed into a tube, power means mounted adjacent the upper end of the former for continuously pushing the web of thermoplastic material along said former, means mounted below said web pushing means for continuously providing a longitudinal heat sealed closure seam in the sheet material while it is advancing along said former, transverse heat sealing dies, electric clutch controlled means for closing the heat seal-

ing dies to form transverse heat seals in the tube to define therein a succession of packages, electric clutch controlled means for opening said heat sealing dies while the tube is advancing on the former, said heat sealing dies including means for severing the tube intermediate the heat sealed zone across the entire tube to leave a sealed end on the package preceding the heat sealing dies and on the package trailing the heat sealing dies, said dies, when closed, advancing with the tube at its speed, means for filling each package before it is transversely sealed at its upper end and severed from the tube, and means for causing the operation of said electric clutch controlled die opening and closing means at intervals equal to predetermined lengths of sections of the web of sheet material including an electric eye responsive to markings on the web material.

7. In an automatic packaging machine having a vertical former about which packaging sheet material is formed to provide a succession of packages, means mounted adjacent the upper end of the former for continuously pushing the web of sheet material along said former, means for continuously providing a longitudinal closure seam in the sheet material forming the succession of packages, a crank operated assembly including heat sealing dies and a knife, said assembly being intermittently movable in an orbital path with the heat sealing dies and knife reciprocating transversely to the line of movement of the sheet material and toward and away from the latter, movement of the heat sealing dies and knife toward the sheet material causing the sealing dies to successively engage longitudinally separated portions of the sheet material while it is advancing to form top and bottom seals in each package and sever the tube intermediate each heat sealed zone across the entire tube to leave a sealed end on the package preceding the heat sealing dies and on the package trailing the heat sealing dies, said dies, when closed, advancing with the tube at the latter's speed of movement, means for filling each package with a predetermined amount of the product to be packaged prior to the formation of the top seal therein, and means controlled by the advance movement of the sheet material for automatically intermittently causing the die and knife carrying assembly to move through its orbital path.

8. In an automatic packaging machine having a former about which a web of packaging thermoplastic sheet material is formed in a tube to provide a succession of packages, means mounted adjacent the inner end of the former for continuously pushing the web of sheet material along said former, means for continuously providing a longitudinal closure seam in the sheet material forming the succession of packages, and transverse heat sealing and severing means intermittently movable in an orbital path to form spaced-apart top and bottom seals in each package and immediately sever the tube intermediate each heat sealed zone while the tube is advancing.

9. In an automatic packaging machine having a vertical former about which packaging sheet material is formed to provide a succession of packages, means mounted adjacent the upper end of the former for continuously pushing the web of sheet material along said former, means for continuously providing a longitudinal closure seam in the sheet material forming the succession of packages, a clutch controlled crank operated assembly including heat sealing dies and a yieldingly mounted knife, said assembly being intermittently movable in an orbital path in a vertical plane with the heat sealing dies and knife additionally reciprocating transversely to the line of movement of the sheet material and toward and away from the latter, movement of the heat sealing dies and knife toward the sheet material causing the sealing dies to engage longitudinally separated portions of the sheet material while it is advancing to form top and bottom seals in each package and sever the tube intermediate each heat sealed zone, said dies, while closed on the sheet material, advancing with it, means for filling each package with a predetermined amount of the product to be packaged prior to the formation of the top seal therein, and means controlled by the advance movement of a predetermined length of the sheet material for energizing said clutch controlled crank operated assembly.

10. In a packaging machine, a tube former for producing from web packaging material a tube from which sections may be transversely sealed and severed to provide a succession of packages; means for continuously advancing the web packaging material along the tube former, there being longitudinally spaced markings along said web at intervals equal to the predetermined lengths of the packages to be produced by the machine; an assembly for repeatedly engaging and disengaging the tube on the former and moving with the tube while in engagement therewith, said assembly having sealing jaws and an end cut-off knife whereby the tube is transversely sealed and severed as said assembly engages the tube; in combination with mechanism whose operation is initiated by said markings on the web for causing said assembly to engage and disengage the tube while the latter is being continuously advanced along the former.

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