

SPECIFICATION

THREE-SIDE SEAL FILM PACKAGING MACHINE

TECHNICAL FIELD

[0001]

This invention relates to a three-side seal film packaging machine. Particularly, this invention relates to the three-side seal film packaging machine that an end sealer mechanism which performs a drive of a vertical direction of approach/separation in a pair of upper and lower end sealers and performs reciprocation of a horizontal direction is simplified and strength of the mechanism is reinforced, besides space can be reduced in a region of the end sealer, peripheral devices which are attached to a three-side seal film package can be incorporated, production or maintenance is easy, and production cost can be reduced.

BACKGROUND ART

[0002]

Conventionally, when packaging a packaging object in a packaging film, and forming a three-side seal package of a predefined length depending on a size of longitudinal, traverse and height direction of the packaging object by the welding of a center sealer (longitudinal sealer) and by the welding and the fusion cutting (the welding and the cutting) of the pair of end sealers (traverse sealers) which approaches and separates, a three-side seal film packaging machine which drives the pair of upper and lower end sealers by three to five gears in at least one side of a frame as shown in a feed direction of a packaging film of the packaging object is known (for example, refer to Patent document No.1-2).

[0003]

One of these gears is a drive gear, and others are driven gears which are engaged to the drive gear respectively and driven such that the pair of end sealers approaches and separates through a transmission means.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0004]

Patent document No.1: Japanese Patent Publication Number Hei9-301325

Patent document No.2: Japanese Patent Publication Number 2013-86836

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0005]

However, in the three-side seal film packaging machine like this, because many gears are used in the region of the end sealers, the mechanism is quite complicated in the structure which composes a transmission device to the end sealers from the gear train, and the production is onerous, the cost increases and the maintenance is troublesome. Besides, substantially considerable space is required from the relation of the size of the gear train and the transmission means to the end sealers. Though the incorporation of the peripheral devices which are attached to a three-side seal film package is required, there was a disadvantage that it was impossible.

[0006]

This invention was carried out in order to solve these disadvantages. The objects of this invention are to provide the three-side seal film packaging machine that the end sealer mechanism is simplified and strength of the mechanism is reinforced, besides space can be reduced in a region of the end sealers, the peripheral devices which are attached to the three-side seal film package can be incorporated, the production or the maintenance is easy, and the

production cost can be reduced.

MEANS FOR SOLVING THE PROBLEMS

[0007]

In order to accomplish such the object, in a three-side seal film packaging machine of this invention, at a main frame, a film supply unit for packaging a packaging object which is supplied from a supply conveyer with a packaging film which is reeled out from a roll film by a former to form a packaging film for packaging object, a center sealer unit for welding the packaging film for packaging object by center sealers cylindrically, a center conveyer unit for feeding the packaging film for packaging object which is welded by the center sealer unit by a center conveyer, an end sealer unit for welding and cutting said cylindrical packaging film for packaging object which is fed from said center conveyer unit by a pair of upper and lower end sealers to form a three-side seal package of a predefined package length, and a transport conveyer unit for transporting the formed three-side seal package by a transport conveyer are provided, and a sub frame is provided at the main frame slidably in the vertical direction, and a gear train, which is provided at one side as shown in a feed direction of the packaging film for packaging object in the sub frame and comprising a drive gear and a pair of driven gears engaged to an upper side and a lower side of the drive gear respectively and arranged in a vertical direction and in a straight line, is provided, and connecting shafts for the pair of driven gears are respectively connected to the lower end sealer through a gate-shaped base which is rotationally driven in phase by first and second cranks of both sides of the sub frame as shown in the feed direction of the packaging film for packaging object, a connecting shaft for the driven gear of the lower side of the pair of driven gears is connected to an upper end sealer through connecting

rods which are rotationally driven in opposite phase by third cranks which are connected to the second crank of both sides of the sub frame as shown in the feed direction of the packaging film for packaging object respectively by an upper end sealer base through resilient members, and the upper end sealer base is supported slidably by guide shafts which are implanted vertically and integrally to the gate-shaped base.

[0008]

In the three-side seal film packaging machine of this invention, a gadget device for forming gadgets which are folded to an inner side by folding the film of the thickness side of the packaging film for packaging object is provided at the upper end sealer base just before the cylindrical packaging film for packaging object is welded and cut by a pair of upper and lower end sealers.

[0009]

In the three-side seal film packaging machine of this invention, an endless brush for assisting the feeding of the packaging film for packaging object in synchronization with the feed speed of the packaging film is arranged selectively on either one of the center sealers and the center conveyer.

EFFECT OF THE INVENTION

[0010]

According to the structure of the three-side seal film packaging machine by this invention, the end sealer mechanism which performs the drive of the vertical direction of the approach/separation in the pair of upper and lower end sealers and performs the reciprocation of the horizontal direction is simplified and the strength of the mechanism is reinforced, besides the space can be reduced in the region of the end sealers, the peripheral devices which are attached to the three-side seal film package can be

incorporated, the production or the maintenance is easy, and the production cost can be reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

[Fig.1] An overall perspective view of the three-side seal film packaging machine according to this invention.

[Fig.2] A perspective view of the center sealer unit in the three-side seal film packaging machine according to this invention.

[Fig.3A] (a) is a perspective view of the end sealer unit in the three-side seal film packaging machine according to this invention. (b) is a mounting explanatory view of the sub frame for the main frame of the end sealer unit. (c) is an exploded perspective view of the lower end sealer portion.

[Fig.3B] (a) is a perspective view of the end sealer unit in the three-side seal film packaging machine according to this invention. (b) is a partially cutaway perspective view of the end sealer unit. (c) is a perspective view of the upper end sealer portion.

[Fig.4] A perspective view of the end sealer unit showing from opposite side of Fig.3A (a) and Fig.3B (a) in the three-side seal film packaging machine according to this invention.

[Fig.5A] A perspective view of the center conveyer unit, the transport conveyer unit and a conveyer opening and closing mechanism in the three-side seal film packaging machine according to this invention.

[Fig.5B] A perspective view of the center conveyer unit, the transport conveyer unit and the conveyer opening and closing mechanism showing a state which detached an endless belt of the conveyer in the three-side seal film packaging machine according to this invention.

[Fig.6] A perspective view of the gadget device used in the three-side seal film packaging machine according to this invention.

[Fig.7] A front view showing a synchronous actuator and the endless

brush of each unit in the three-side seal film packaging machine according to this invention.

[Fig.8] A motion diagram of the upper and a lower end sealers in the three-side seal film packaging machine according to this invention.

[Fig.9] A perspective view showing a state that a three-side seal package is formed by implementing gadgets in the three-side seal film packaging machine according to this invention.

[Fig.10] Anelectric controlblock diagram showing anelectric control device of the three-side seal film packaging machine according to this invention.

[Fig.11] A front view showing a box motion of the upper and a lower end sealers in the three-side seal film packaging machine according to this invention.

MODE FOR CARRYING OUT THE INVENTION

[0012]

Hereinafter, the preferable embodiment of the three-side seal film packaging machine of this invention is explained by referring to the drawings.

[0013]

As shown in Fig.1, in the three-side seal film packaging machine 100 of this invention, a film supply unit 20 which forms a packaging film for packaging object 18 by packaging a packaging object W which is supplied from a supply conveyer 10 with a packaging film 14 (Fig.7) which is reeled out from a roll film 12 by a former 16, a center sealer unit 24 (Fig.2) which welds the packaging film for packaging object 18 by center sealers 22a, 22b cylindrically, a center conveyer unit 28 which feeds the packaging film for packaging object 18 (Fig.9) which is welded by the center sealer unit 24 by a center conveyer 26, an end sealer unit 32 which forms a three-side

seal package PW (Fig.9) of a predefined package length by welding and cutting the cylindrical packaging film for packaging object 18 which is fed from the center conveyer unit 28 by the pair of end sealers, that is by upper and lower end sealers 30a, 30b (Fig.3A, Fig.3B, Fig.4) and a transport conveyer unit 34 which transports the formed three-side seal package PW by a transport conveyer 33 are provided at a main frame 36.

[0014]

The main frame 36 is fastened firmly in the packaging machine body which is composed by combining pipes 101 and T-shaped joints 102. By this composition, the three-side seal film packaging machine is lightweight and is made as a strong structure.

[0015]

In the film supply unit 20, a pusher (not shown in the drawing) is provided in a feeding concave path 11 which is formed in width corresponding to the lateral width of the packaging object W in the supply conveyer 10, and the packaging film 14 is reeled out from the roll film 12 which is suspended at a roller 12a by being wound sequentially to rollers 12b, 12c, 12d, 12e (Fig.7). The packaging object W which is supplied from the supply conveyer 10 is packaged by the former 16 with the packaging film 14 and the packaging film for packaging object 18 is formed.

[0016]

In the center sealer unit 24 (Fig.2), a pair of center sealers 22a, 22b as bar sealers, and a pair of catch rollers 15a-15b and a pair of seal rollers 15c-15d which are arranged at that back and forth are arranged in the straight line in the traveling direction of the packaging film for packaging object 18. The packaging film for packaging object 18 is stretched by the catch rollers 15a-15b, and is welded cylindrically by the heated center sealers 22a, 22b

and seal rollers 15c-15d. For initial setting before operation or for maintenance, the pair of center sealers 22a, 22b, the pair of catch rollers 15a-15b and the pair of seal rollers 15c-15d can be opened by opening/closing levers 15e-15f. During operation of the package, they are closed so as to sandwich the edges of both ends of the packaging film for packaging object 18 between them and heat welding is performed while stretching the edges of both ends to the feeding direction.

[0017]

The catch rollers 15a-15b are driven by a servomotor Mb (Fig.7), a catch roller drive shaft 24a, a catch roller drive bevel gear 24c, a catch roller driven bevel gear 24e and catch roller gears 15j, 15i. The seal rollers 15c-15d are driven by the servomotor Mb (Fig.7), a seal roller drive shaft 24b, a seal roller drive bevel gear, a seal roller driven bevel gear 24h and seal roller gears 15g, 15h.

[0018]

In the center conveyer unit 28, the packaging film for packaging object 18 which is welded at the center sealer unit 24 is fed by the center conveyer 26.

[0019]

In the end sealer unit 32, the cylindrical packaging film for packaging object 18 which is fed from the center conveyer unit 28 is welded and cut by the pair of upper and lower end sealers 30a, 30b, and the three-side seal package PW of the predefined package length is formed.

[0020]

In the transport conveyer unit 34, the formed three-side seal package PW is transported by the transport conveyer.

[0021]

In addition, in the center conveyer 26 of the center conveyer

unit 28 and the transport conveyer 33 of the transport conveyer unit 34, space of both conveyers is opened and closed respectively depending on each approach/separation of the pair of upper and lower end sealers 30a, 30b of the end sealer unit 32. This conveyer opening and closing mechanism 70 (Fig.5A, Fig.5B, Fig.6) is explained later in detail.

[0022]

As shown in Fig.3A, Fig.3B and Fig.4, a sub frame 38 is provided slidably in the vertical direction in the main frame 36.

[0023]

The sub frame 38 has a pair of sub frame plates 38a, 38b which faces, and is slidable in the vertical direction along four support pillars 36c which are fixed at the main frame 36 with a lower base plate 36a and an upper base plate 36b. That is, key grooves 38c that slide keys 38g fit into are provided at upper and lower positions in the sub frame plates 38a, 38b, and meanwhile, key slidable long grooves 36d are provided at the upper and lower positions in the support pillars 36c. Therefore, the sub frame 38 is guided in the key slidable long grooves 36d by the slide keys 38g which fit into the key grooves 38c of the sub frame plates 38a, 38b, and becomes slidable in the vertical direction along the support pillars 36c.

[0024]

In the sub frame 38, a gear train 27 which comprises a drive gear 21 which is driven by an end sealer servomotor Ma and the pair of driven gears 23, 25 which is engaged to the upper side and the lower side of the drive gear 21 respectively and is arranged in the vertical direction and in the straight line is provided at one side A as shown in the feed direction of the packaging film for packaging object 18.

[0025]

Connecting shafts 29a, 29b of the pair of driven gears 23,

25 are respectively connected to the lower end sealer 30b through a gate-shaped base 37 which is rotationally driven in phase by first and second cranks 31a-31b, 35a-35b of both sides A, B of the sub frame 38 as shown in the feed direction of the packaging film for packaging object 18.

[0026]

In the gate-shaped base 37, support pillar parts 37a, 37b and a base part 37c are connected firmly. That is, attaching members 51c, 51d are attached to the support pillar parts 37a, 37b, and lower parts of ring connecting hub 51a, 51b penetrate the base part 37c and are fitted into the ring connecting hubs 51a, 51b, and are connected by screws 51e.

[0027]

The lower end sealer 30b has a built-in end sealer heater 86 (Fig.10), and is fixed firmly on the base part 37c.

[0028]

In this transmission structure, one end of pins 39a-39b is fixed to one end of the first cranks 31a-31b which are fixed firmly to both ends of the connecting shaft 29a which is fixed firmly to the driven gear 23, and the other end of the pins 39a-39b is pivotally attached to upper connecting parts 37d, 37f of the support pillar parts 37a-37b of the gate-shaped base 37 through bearings 37h.

[0029]

One end of pins 40a-40b is fixed to one end of the second cranks 35a-35b which are fixed firmly to both ends of the connecting shaft 29b which is fixed firmly to the driven gear 25, and the other end of the pins 40a-40b is pivotally attached to lower connecting parts 37e, 37g of the support pillar parts 37a-37b of the gate-shaped base 37 through the bearings 37h and furthermore is fixed to one end of third cranks 43a-43b in protruded state. Pins 41a-41b are

fixed to the other end of the third cranks 43a-43b.

[0030]

In this way, regarding the connecting shaft 29b of the driven gear 25 of the lower side of the pair of driven gear, in the other end of the pins 40a-40b which are fixed firmly to the second cranks 35a-35b of both ends A, B of the sub frame as shown in the feed direction F of the packaging film for packaging object 18 respectively, third cranks 43a-43b are fixed to the bearings which are provided at the lower connecting parts 37e-37g of the support pillar parts 37a-37b of the gate-shaped base 37 by being attached pivotally, penetrated and protruded.

[0031]

Besides, the connecting shaft 29b of the driven gear 25 of the lower side of the pair of driven gears is connected to an upper end sealer base 45 through connecting rods 44a-44b which are rotationally driven in opposite phase by the third cranks 43a, 43b which are connected by being attached pivotally, penetrated and protruded to the bearings 37h that the pins 40a-40b which are fixed firmly to the second cranks 35a-35b of both sides A, B of the sub frame as shown in the feed direction of the packaging film for packaging object 18 respectively are provided at the lower connecting parts 37e-37g of the support pillar parts 37a-37b of the gate-shaped base 37.

[0032]

The connecting rods 44a-44b and the upper end sealer base 45 are connected by rod ends 44e-44f. The upper end sealer 30a is fixed to the upper end sealer base 45 through resilient members 46c-46d (Fig.11) which are installed by attaching members 46a-46b so as to repel freely in upper and lower direction.

[0033]

The upper end sealer base 45 is supported slidably at guide shafts 51 which are implanted vertically and integrally to the gate-shaped base 37. Concretely, in the guide shafts 51, the lower ends penetrate attaching members 51a-51b which are fixed firmly to the base part 37c and are fixed firmly by attaching arms 51c-51d which are fixed firmly to the inside of the upper parts of the support pillar parts 37a-37b of the gate-shaped base 37 respectively, and the upper ends are fixed with a stationary plate 52 integrally.

[0034]

The upper end sealer 30a has a built-in knife (not shown in the drawing) which cuts the packaging film for packaging object 18 and a built-in end sealer heater 85 (Fig.10), and is installed at the lower direction of the upper end sealer base 45 through the resilient members 46c-46d. Therefore, when the upper end sealer 30a contacts to the lower end sealer 30b, upward movement is allowed while resisting the elasticity of the resilient members 46c-46d in the upper end sealer 30a. Thereby, the welding of the upper end sealer 30a and the packaging film for packaging object 18 is performed certainly.

[0035]

According to such the transmission structure, the end sealer mechanism can be simplified and also the strength of the mechanism can be reinforced.

[0036]

According to the structure that the gear train 27 which comprises the drive gear 21 and the pair of driven gears 23, 25 is provided in the vertical direction and in the straight line, and that the upper and lower end sealers 30a, 30b are driven by the driven gears 23, 25, the first and second cranks 31a-31b, 35a-35b and the third cranks 43a, 43b, wide space is formed in the neighborhood of

the end sealer unit 32.

[0037]

By using this wide space, as shown in Fig.5A, Fig.6 and Fig.9, in the three-side seal film packaging machine of this invention, a gadget device 53 for folding the film of the thickness side PS of the packaging film for packaging object 18 to an inner side is attached to the upper end sealer base 45 by brackets 54b.

[0038]

Just before the cylindrical packaging film for packaging object 18 is welded and cut by the pair of upper and lower end sealers 30a, 30b, press bars 54a of cylinders 54 protrude, and the gadget device 53 forms gadgets 55 which are folded to an inner side by folding the film of the thickness side PS of the packaging film for packaging object 18. The cylinders 54 are controlled by an electric control device 80 depending on detection output of an encoder E (Fig.10).

[0039]

Besides, by using this wide space, as shown in Fig.7, in the three-side seal film packaging machine of this invention, an endless brush 56 for assisting the feeding of the packaging film for packaging object 18 in synchronization with the feed speed of the packaging film for packaging object 18 is arranged selectively on either one of the center sealer unit 24, the center sealers 22a, 22b and the center conveyer 26. The endless brush 56 is installed on the main frame 36 such that reversal is performed freely so as to arrange selectively on either one of the center sealers 22a, 22b and the center conveyer 26. In addition, the explanation of the means for installing is omitted.

[0040]

As previously described, in the center conveyer 26 of the center conveyer unit 28 and the transport conveyer 33 of the transport

conveyer unit 34, the space of both conveyers is opened and closed respectively depending on each approach/separation of the pair of upper and lower end sealers 30a, 30b of the end sealer unit 32.

[0041]

In this conveyer opening and closing mechanism 70, for performing such the opening and closing operation, in the center conveyer 26 and the transport conveyer 33, as shown in Fig.5A, endless belts 57, 58 are wound on rollers 63a, 63b, 63c, 63d, 63e, 63f and rollers 64a, 64b, 64c, 64d, 64e, 64f, 64g in expandable and contractible state freely (Fig.5A, Fig.5B). Among this, the rollers 63e, 63f, 64c, 64d are arranged at opening and closing frames 59a-59b, 60a-60b for performing this opening and closing operation, and are movable in forward direction or opposite direction for the feed direction F of the packaging film for packaging object 18. When the center conveyer 26 and the transport conveyer unit 34 are opened, the roller 63f of the endless belt 57 and the roller 64d of the endless belt 58 move each other such that they separate. Conversely, when the center conveyer 26 and the transport conveyer unit 34 are closed, the roller 63f of the endless belt 57 and the roller 64d of the endless belt 58 move each other such that they approach. In this way, the space of both conveyers is opened and closed respectively depending on each approach/separation of the upper and lower end sealers 30a, 30b.

[0042]

A pair of opening and closing frames 59a-59b, 60a-60b which has guide groove cams 61, 62 for performing the opening and closing operation of the center conveyer 26 and the transport conveyer unit 34 is provided at the main frame 36 in horizontal direction astride the pair of upper and lower end sealers 30a, 30b.

[0043]

The guide groove cam 61 of the opening and closing frames 59a-59b has a lower guide groove cam part 61a which extends to a vertical direction in the straight line and an upper guide groove cam part 61b which continues to it, shifts to an opposite direction for the feed direction of the packaging film for packaging object 18 and extends to a vertical direction in the straight line. Meanwhile, the guide groove cam 62 of the opening and closing frames 60a-60b has a lower guide groove cam part 62a which extends to a vertical direction in the straight line and an upper guide groove part 62b which continues to it, shifts to the feed direction of the packaging film for packaging object 18 and extends to a vertical direction in the straight line.

[0044]

Rollers 72a, 72b fit into the guide groove cams 61, 62 of the opening and closing frames 59a-59b, 60a-60b respectively, and become those cam followers. The space of both conveyers is opened and closed respectively by the rollers 63a, 64a, the lower guide groove cam part 61a and the upper guide groove cam part 61b depending on each approach/separation of the upper and lower end sealers 30a, 30b.

[0045]

Next, the synchronization and the driving of each unit of the three-side seal film packaging machine are explained.

[0046]

As shown in Fig.7, the supply conveyer 10 is driven by a supply conveyer servomotor Mc by a gear 10b to which a chain 10a is applied.

[0047]

In the film supply unit 20, the center sealer unit 24, the transport conveyer unit 34 and the endless brush 56, the roller shaft

12a and the roller 12b are driven through the V belt and by a center sealer servomotor Mb by gears 24a, 24b, 26a, 33a to which a chain 24c is applied.

[0048]

In the electric control device 80 (Fig.1, Fig.10), a setup panel 83 for setting a specification of such as package length or a parameter depending on the three-side seal package which should be produced and an operation panel 84 for operating the three-side seal film packaging machine 100 are provided.

[0049]

The electric control device 80 controls the supply conveyer servomotor Mc and drives the supply conveyer 10. Feed quantity of the supply conveyer 10 or a positional marker on the packaging film 14 is measured by an encoder E, and that measured signal is fed back to the electric control device 80.

[0050]

The electric control device 80 controls the end sealer servomotor Ma and the center sealer servomotor Mb. The center sealer servomotor Mb drives the center sealer unit 24, and further drives the center conveyer unit 28 and the transport conveyer unit 34 from the center sealer unit 24.

[0051]

Besides, the electric control device 80 controls the heaters of the center sealers 22a, 22b, the end sealer heater 85 and the end sealer heater 86.

[0052]

Besides, the electric control device 80 drives the gadget device 53 and the endless brush 56.

[0053]

By the encoder E of the supply conveyer 10, each unit is

driven synchronously by the electric control device 80 (Fig.10). However, it is preferable that the feed speed of the transport conveyer 33 is faster than that of the center conveyer 26.

[0054]

In addition, a height adjustment mechanism 90 of the end sealer unit 32 is provided (Fig.3A, Fig.3B, Fig.7). The height adjustment mechanism 90 is screwed to an adjustment plate 92 which is fixed to the lower end of the sub frame 38 by height adjustment screws 93 from the lower side of the lower base plate 36a of the main frame 36, and is slidable in the vertical direction by rotating an adjustment knob 91 from the lower direction. In the height adjustment mechanism 80 (90?), when rotating the adjustment knob 91, a contact position of the upper and lower end sealers 30a, 30b can be matched to the center of the thickness of the packaging object W depending on the thickness of the packaging object W.

[0055]

In the three-side seal film packaging machine which is composed in this way, firstly, by the setup panel 83 of the electric control device 80, an operator (worker) sets the specification of such as packaging length or the parameter depending on the three-side seal package which should be produced. Next, in the center sealer unit 24, for initial setting before operation, the pair of center sealers 22a, 22b, the pair of catch rollers 15a-15b and the pair of seal rollers 15c-15d are opened by the opening/closing levers 15e-15f. The packaging film 14 in the film supply unit 20 is guided previously to the center sealers 22a, 22b from the former 16, and the three-side seal package which packages the packaging object W by the packaging film 14 is prepared. If the three-side seal package is prepared, the pair of center sealers 22a, 22b, the pair of catch rollers 15a-15b and the pair of seal rollers 15c-15d are returned

to the closed state from the open state by the opening/closing levers 15e-15f. In addition, the electric heaters 85, 86 (Fig.10) of each sealer are electrified previously and their temperature are controlled such that the packaging film 14 can be welded by the center sealers 22a, 22b and welded and cut by the upper and lower end sealers 30a, 30b.

[0056]

If the operator (worker) puts the packaging object W on the supply conveyer 10 and operates the operation panel 84, the supply conveyer 10 is driven by the supply conveyer servomotor Mc by the electric control device 80.

[0057]

Simultaneously, the film supply unit 20, the center sealer unit 24, the center conveyer 26 and the transport conveyer 33 of the transport conveyer unit 34 and the endless brush 56 are driven by the center sealer servomotor Mb by the electric control device 80.

[0058]

In the center sealer unit 24, the catch rollers 15a-15b and the seal rollers 15c-15d are driven by the servomotor Mb, and the packaging film for packaging object 18 is stretched by the catch rollers 15a-15b, and is welded cylindrically by the heated center sealers 22a, 22b and the heated seal rollers 15c-15d, and sealed at the center.

[0059]

The packaging film 14 which is sealed at the center and encloses the packaging object W is driven by the center conveyer 26 of the center sealer unit 24, and is fed to the pair of upper and lower end sealers 30a, 30b of the end sealer unit 32.

[0060]

In the end sealer unit 32, the end sealer servomotor Ma is driven by the electric control device 80, and the connecting shafts 29a, 29b of the pair of driven gears 23, 25 are connected to the lower end sealer 30b through the gate-shaped base 37 which is rotationally driven in phase by the first and the second cranks 31a-31b, 35a-35b, and the connecting shaft 29b of the driven gear 25 of the lower side is connected to the upper end sealer 30a through the resilient members 46 by the upper end sealer base 45 through the connecting rods 44a-44b which are rotationally driven in opposite phase by the third cranks 43a, 43b which are connected by being attached pivotally, penetrated and protruded to the bearings 37h that the pins 40a-40b which are fixed firmly to the second cranks 35a-35b are provided at the lower connecting parts 37e-37g of the support pillar parts 37a-37b of the gate-shaped base 37. Therefore, the upper and lower end sealers 30a, 30b perform circular movements and mutually approach and separate in opposite phase, and in the pair of end sealers 30a, 30b, vertical movement whose phase shifts 180 degrees and reciprocating movement and swinging movement are combined, and the movement where combined trajectories UL, LL as shown in Fig.8, Fig.11 are traced is performed.

[0061]

Naturally, the space of both conveyers is opened and closed respectively by the rollers 63f, 64d, the lower guide groove cam part 61a and the upper guide groove cam part 61b depending on the each approach/separation of the upper and lower end sealers 30a, 30b.

[0062]

In this case, because the upper end sealer 30a is installed at the lower direction of the upper end sealer base 45 through the resilient members 46c, 46d, when the upper end sealer 30a contacts

to the lower end sealer 30b, the pair of end sealers 30a, 30b overlaps in the vertical direction astride cutting line where the packaging film for packaging object 18 which packages the package object W passes. Therefore, that distance can be absorbed by the elastic force of the resilient members 46c, 46d which is provided at the upper end sealer 30a, and the welding and the cutting of the packaging film for packaging object 18 is performed certainly (Fig.8, Fig.11). In addition, This resilient members 46c, 46d have also a function which regulates the pressure for the welding and the cutting for the packaging film for packaging object 18 of the pair of end sealers 30a, 30b.

[0063]

In this way, the end sealer unit 32 performs quasi-box motion (anomalous circular movement) so as to approach and separate each other in synchronization with the transportation speed of the packaging film for packaging object 18, that is, so as to drive vertically the pair of upper and lower end sealers 30a, 30b by the shift of 180 degrees of the phase. In this case, the pair of upper and lower end sealers 30a, 30b maintains a synchronous speed (constant speed) which synchronizes to the transportation speed of the packaging film for packaging object 18 in a period to a moment of separation Lb from a moment of contact La that the pair of upper and lower end sealers 30a, 30b contacts, and moves concurrently to a transport direction of the three-side seal package horizontally. The upper and lower end sealers 30a, 30b are moved in that period (La-Lb) by the synchronous speed and by the abovementioned elastic force of the resilient members 46c, 46d, thereby the welding of the packaging film for packaging object 18 can be performed certainly. Such control is performed by driving and controlling the end sealer servomotor Ma by the electric control device 80.

[0064]

Outside the period of this synchronous speed, the pair of upper and lower end sealers 30a, 30b performs the quasi-box motion (anomalistic circular movement) in a variable speed movement. That is, the pair of upper and lower end sealers 30a, 30b is accelerated and is sped up after passage of the period (La-Lb) of the synchronous speed, and is decelerated before the period (La-Lb) of the synchronous speed.

[0065]

Therefore, in this three-side seal film packaging machine, the maintenance of the synchronous speed and the operation of the variable speed of the upper and lower end sealers 30a, 30b are performed, and the high efficiency in the production of the three-side seal package can be attempted.

[0066]

In this way, in the pair of end sealers 30a, 30b, the vertical movement whose phase shift 180 degrees and the reciprocating movement and the swinging movement are combined, and the movement where combined trajectories UL, LL as shown in Fig.8, Fig.11 are traced is performed, and by the welding and the cutting of the pair of end sealers 30a, 30b, the feed quantity of the supply conveyer 10 is measured by the encoder E, and the three-side seal package PW which has the predefined package length is formed depending on the parameter which is set by the electric control device 80 (Fig.9). In addition, just before the packaging film for packaging object 18 is welded and cut by the pair of upper and lower end sealers 30a, 30b, the gadgets 55 are formed by the cylinders 54 of the gadget device 53.

[0067]

In addition, the endless brush 56 for assisting the feeding of the packaging film for packaging object 18 is arranged selectively on either one of the center sealer unit 24, the center sealers 22a,

22b sides (P1) and the center conveyer 26 side (P2) (Fig.7), and the inside of the packaging film for packaging object 18 which packages the packaging object W is degassed, thereby the three-side seal package PW whose oxidation is prevented can be formed.

[0068]

The three-side seal package PW which is formed in this way is transported by the transport conveyer 33 of the transport conveyer unit 34.

[0069]

As is clear from the above explanation, according to the three-side seal film packaging machine of this invention, the end sealer mechanism which performs the drive of the vertical direction of the approach/separation in the pair of upper and lower end sealers and performs the reciprocation of the horizontal direction is simplified and the strength of the mechanism is reinforced, besides the space can be reduced in the region of the end sealer, the peripheral devices which are attached to the three-side seal film package can be incorporated, the production or the maintenance is easy, and the production cost can be reduced.

EXPLANATION OF THE NUMERALS

[0070]

W	packaging object
PW	three-side seal package
F	feed direction of the packaging film for packaging object
A	one side
A, B	both sides
PS	thickness side of the packaging film for packaging object
100	three-side seal film packaging machine
10	supply conveyer
12	roll film

14	packaging film
16	former
18	packaging film for packaging object
20	film supply unit
21	drive gear
22a, 22b	center sealer
23, 25	driven sealer
(23	upper side driven gear)
(25	lower side driven gear)
24	center sealer unit
26	center conveyer
27	gear train
28	center conveyer unit
29a, 29b	connecting shaft
30a, 30b	a pair of end sealers
(30a	upper end sealer)
(30b	lower end sealer)
31a-31b	first crank
32	end sealer unit
33	transport conveyer
34	transport conveyer unit
35a-35b	second crank
36	main frame
37	gate-shaped base
38	sub frame
43a-43b	third crank
44a-44b	connecting rod
45	upper end sealer base
46c-46d	resilient member
51	guide shaft

53	gadget device
55	gadget

CLAIMS

1. A three-side seal film packaging machine providing, at a main frame,

a film supply unit for packaging a packaging object which is supplied from a supply conveyer with a packaging film which is reeled out from a roll film by a former to form a packaging film for packaging object,

a center sealer unit for welding said packaging film for packaging object by center sealers cylindrically,

a center conveyer unit for feeding said packaging film for packaging object which is welded by said center sealer unit by a center conveyer,

an end sealer unit for welding and cutting said cylindrical packaging film for packaging object which is fed from said center conveyer unit by a pair of upper and lower end sealers to form a three-side seal package of a predefined package length, and

a transport conveyer unit for transporting the formed three-side seal package by a transport conveyer,
characterized by:

a sub frame which is provided at said main frame slidably in the vertical direction,

a gear train provided at one side as shown in a feed direction of said packaging film for packaging object in said sub frame and comprising a drive gear and a pair of driven gears engaged to an upper side and a lower side of said drive gear respectively and arranged in a vertical direction and in a straight line,

connecting shafts for the pair of driven gears being respectively connected to said lower end sealer through a gate-shaped base which is rotationally driven in phase by first and second cranks of both sides of said sub frame as shown in the feed direction of

said packaging film for packaging object,

a connecting shaft for the driven gear of the lower side of the pair of driven gears being connected to said upper end sealer through connecting rods which are rotationally driven in opposite phase by third cranks which are connected to said second cranks of both sides of said sub frame as shown in the feed direction of said packaging film for packaging object respectively by an upper end sealer base through resilient members, and

said upper end sealer base being supported slidably by guide shafts which are implanted vertically and integrally to said gate-shaped base.

2. The three-side seal film packaging machine according to claim 1, characterized by:

a gadget device for forming gadgets which are folded to an inner side by folding a film of a thickness side of said packaging film for packaging object being provided at said upper end sealer base just before said cylindrical packaging film for packaging object is welded and cut by a pair of upper and lower end sealers.

3. The three-side seal film packaging machine according to claim 1, characterized by:

an endless brush for assisting the feeding of said packaging film for packaging object in synchronization with feed speed of said packaging film being arranged selectively on either one of said center sealers and said center conveyer.

Abstract

To make it possible to simplify an end sealer mechanism and increase the strength of the mechanism, as well as to incorporate a peripheral device which accompanies three-side seal film packaging to save space in an end sealer region. A gear train (27) is provided comprising a drive gear (21) and a pair of driven gears (23, 25) engaged with an upper side and a lower side, respectively, of the drive gear and disposed in a vertical direction and in a straight line, connecting shafts (29a, 29b) of the pair of driven gears are connected to a lower end sealer (30b) through a gate-shaped base (37) which is rotationally driven in phase by first and second cranks (31a-31b, 35a-35b), and the connecting shaft (29b) of the lower-side driven gear is connected to an upper end sealer (30a) by an upper end sealer base (45) through connecting rods (44a-44b) which are rotationally driven in opposite phase by third cranks (43a-43b) connected to the second cranks.