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Abstract

It is intended to correct print pitches P at which a pattern A is printed on a plastic film 1 repeatedly. A first optical sensor detects positions at which the pattern A is printed on the plastic film 1 repeatedly, to measure the print pitches P individually. A first stretching device 4 stretches the plastic film 1 after measuring the print pitch P to correct the print pitches P individually. A second optical sensor detects the positions after correcting the print pitch P to measure a sum of print pitches  $P(1) + P(2) + \dots + P(N)$  of a number of patterns A. A second stretching device 10 stretches the plastic film 1 after measuring the sum of print pitches to correct the sum of print pitches.

Print Pitch Correcting Apparatus for Plastic Film

Technical Field

The invention relates to an apparatus for correcting  
5 print pitches at which a pattern is printed on a plastic  
film repeatedly.

Background

For example, in a machine for successively making  
plastic bags each of which includes a pattern printed  
10 thereon, a plastic film is fed longitudinally thereof.  
The plastic film includes the pattern printed thereon  
repeatedly, with a print pitch being predetermined. The  
plastic film is fed intermittently for a length  
15 corresponding to the print pitch and stopped temporarily  
whenever being fed intermittently. In general, plastic  
films are superposed with each other. The plastic films  
are then heat sealed with each other by a heat seal device  
and cross cut by a cross cutter whenever being fed  
intermittently and when being stopped temporarily, to  
20 successively make plastic bags.

In this case, conformity in pattern is required  
between the plastic films. On the other hand, minute  
errors must exist in the print pitches of plastic film to  
be accumulated, resulting in a discrepancy in pattern  
25 between the plastic films. In order to overcome this  
problem, there has been proposed an apparatus for  
correcting the print pitches, as disclosed in Japanese  
Patent No. 4,121,722.

In the apparatus of the patent, a plurality of  
30 optical sensors are disposed at a path along which the  
plastic films are fed, to detect and compare positions at  
which the patterns are printed on the plastic films  
repeatedly. In addition, the apparatus is arranged to

heat a specific film partially to stretch it by tension at a position predetermined upstream of the optical sensors when the specific film goes ahead of other films. The apparatus can therefore correct the print pitches,  
5 conformity in pattern being obtained between the plastic films.

However, the apparatus can merely correct the print pitches of the plastic films relatively to each other. The apparatus cannot correct the print pitches  
10 individually to keep them at a fixed value. In addition, when stretching the plastic film, the print pitch is fluctuated by the stretching amount. The plastic films are then heat sealed with each other and cross cut by the heat seal device and the cross cutter at a position  
15 predetermined with respect to the pattern. The plastic bag must therefore have a size changed by the print pitch fluctuated. The apparatus cannot keep the size constant. Furthermore, the heat seal device and the cross cutter have to be moved by a drive means for adjustment of  
20 position when operating the machine so that the plastic films should be heat sealed and cross cut at the position predetermined with respect to the pattern, resulting in technical problems.

It has also been proposed in the patent to keep an  
25 average of print pitches constant by correcting the print pitches. However, the apparatus cannot correct the print pitches individually all the same. It can merely keep the average of print pitches.

By the way, the apparatus is arranged to heat the  
30 plastic film partially to stretch it by tension, as described previously. However, the plastic film is not always suitable for heating. There has therefore been proposed a device for stretching a plastic film in a

different way, as disclosed in Japanese Patent Publication No. 4,461,201. The device can stretch a plastic film by using rollers without heating the plastic film partially.

An embodiment of the invention may provide an apparatus for correcting print pitches at which a pattern is printed on a plastic film repeatedly, which can correct the print pitches individually.

#### Summary of the Invention

A first aspect of the invention provides an apparatus for correcting print pitches at which a pattern is printed on a plastic film repeatedly, the apparatus comprising: feeding rollers by which the plastic film can be fed intermittently for a length corresponding to the print pitch and stopped temporarily whenever being fed intermittently. The apparatus further includes a first optical sensor disposed at a path along which the plastic film is fed intermittently, and for detecting positions at which the pattern is printed on the plastic film repeatedly, to measure the print pitches individually.

The apparatus further comprises a first stretching device disposed at the path and downstream of the first optical sensor that can stretch the plastic film after measuring the print pitch and when the plastic film is stopped temporarily, to correct the print comprises a second optical sensor disposed at the path that can detect the positions after correcting the print pitches, to measure a sum of print pitches of a number of patterns. The apparatus further comprises a second stretching device disposed at the path that can stretch the plastic film after measuring the sum of print pitches and when the plastic film is stopped temporarily, to correct the sum of print pitches.

In a preferred embodiment, the apparatus further

includes a control device arranged to measure the print pitches individually and obtain measurement values in response to detecting signals transmitted from the first optical sensor. The first stretching device can be operable by the control device to stretch the plastic film and correct the print pitch when the measurement value is less than a reference value to result in a difference exceeding a predetermined value, between the measurement value and the reference value.

10 The control device can be arranged to recognize if the print pitch contains a short or excess correcting amount after correcting. The short or excess correcting amount can be stored in the control device and then cleared by the measurement value of next print pitch to obtain a cleared value. The first stretching device can be operable by the difference between the cleared value, which is used as the measurement value, and the reference value.

20 The predetermined value can comprise a minimum stretching amount predetermined in the first stretching device. The first stretching device can be operable by the control device to stretch the plastic film when the measurement value is less than the reference value to result in the difference exceeding the minimum stretching amount. The control device can be arranged to recognize if the print pitch is short by an uncorrected amount less than the minimum stretching amount after correcting. The uncorrected amount can be stored in the control device and then subtracted from the measurement value of next print pitch to obtain a subtracted value. The first stretching device can be operable by the difference between the subtracted value, which is used as the measurement value, and the reference value.

The control device can be arranged to measure the sum of print pitches of the number of patterns to obtain a measurement value in response to a detecting signal transmitted from the second optical sensor. The second stretching device can be operable by the control device to stretch the plastic film and correct the sum of print pitches when the measurement value is less than a reference value to result in a difference exceeding a predetermined value, between the measurement value and the reference value.

The control device can be arranged to recognize if the sum of print pitches contains a short or excess correcting amount after correcting. The short or excess correcting amount can be stored in the control device and then cleared by the measurement value of next sum of print pitches to obtain a cleared value. The second stretching device can be operable by the difference between the cleared value, which is used as the measurement value, and the reference value.

The predetermined value can comprise a minimum stretching amount predetermined in the second stretching device. The second stretching device can be operable by the control device to stretch the plastic film when the measurement value is less than the reference value to result in the difference exceeding the minimum stretching amount. The control device can be arranged to recognize if the sum of print pitches is shortage by an uncorrected amount less than the minimum stretching amount after correcting. The uncorrected amount can be stored in the control device and then subtracted from the measurement value of next sum of print pitches to obtain a subtracted value. The second stretching device can be operable by the difference between the subtracted value, which can be

used as the measurement value, and the reference value.

An upstream optical sensor can be disposed at the path. A downstream optical sensor can be disposed at the path and downstream of the upstream optical sensor and spaced from the upstream optical sensor at a distance  
5 corresponding to an integral multiple of reference value of print pitch. The upstream and downstream optical sensors can detect the positions at which the pattern is printed on the plastic film repeatedly. The first optical  
10 sensor can comprises the upstream optical sensor to measure the print pitches individually. The second optical sensor can comprises the upstream and downstream optical sensors to measure the sum of print pitches of the number of patterns.

15 An additional optical sensor may be disposed at the path and upstream of the upstream optical sensor and spaced from the upstream optical sensor at a distance corresponding to the print pitch or an integral multiple thereof. The additional optical sensor can detect the  
20 positions at which the pattern is printed on the plastic film repeatedly. The first optical sensor can comprise the upstream optical sensor and the additional optical sensors to measure the print pitches individually.

The first stretching device can be disposed  
25 downstream of the upstream optical sensor. The downstream optical sensor can be disposed downstream of the first stretching device. The second stretching device can be disposed downstream of the downstream optical sensor.

In another embodiment, the first and second  
30 stretching devices can comprise a single stretching device disposed downstream of the upstream optical sensor. The downstream optical sensor can be disposed downstream of the single stretching device.

The feeding rollers can be disposed at the path and downstream of the upstream optical sensor. The feeding rollers can be operated by the control device in response to the detecting signals transmitted from the upstream  
5 optical sensor so that the plastic film be fed intermittently for the length corresponding to the print pitch.

The apparatus can be incorporated in a machine including a heat seal device and a cross cutter. The  
10 plastic films can be superposed with each other after correcting the print pitches. The plastic films can then be heat sealed with each other by the heat seal device and cross cut by the cross cutter, to successively make plastic bags.

15 According to another aspect of the invention, there is provided an apparatus for correcting print pitches at which a pattern is printed on a plastic film repeatedly, the plastic film capable of being fed longitudinally thereof, the apparatus comprising: an upstream optical  
20 sensor disposed at a path along which the plastic film can be fed, to detect positions at which the pattern is printed on the plastic film repeatedly; feeding rollers disposed at the path and downstream of the upstream optical sensor, the plastic film capable of being fed by  
25 the feeding rollers; a first stretching device disposed at the path and downstream of the upstream optical sensor, to stretch the plastic film; a downstream optical sensor disposed at the path and downstream of the feeding rollers and the first stretching device and spaced from the  
30 upstream optical sensor at a distance corresponding to an integral multiple of reference value of print pitch, to detect the positions at which the pattern is printed on the plastic film repeatedly; a second stretching device

disposed at the path and downstream of the downstream optical sensor, to stretch the plastic film; and a control device arranged to receive detecting signals transmitted from the upstream and downstream optical sensors, the feeding rollers being operable by the control device in response to the detecting signals transmitted from the upstream optical sensor so that the plastic film can be fed intermittently for a length corresponding to the print pitch and stopped temporarily whenever being fed intermittently. The control device is arranged to measure the print pitches individually to obtain the measurement values in response to the detecting signals transmitted from the upstream optical sensor. The first stretching device being operable by the control device to stretch the plastic film and correct the print pitches individually when the measurement value is less than a reference value of print pitch to result in the difference exceeding a first predetermined value and when the plastic film is stopped temporarily. The control device is further arranged to measure the sum of print pitches of the number of patterns to obtain the additional measurement value in response to the detecting signals transmitted from the upstream and downstream optical sensors. The second stretching device is operable by the control device to stretch the plastic film and correct the sum of print pitches when the additional adjustment value is less than the reference value of sum of print pitches to result in the difference exceeding a second predetermined value and the plastic film is stopped temporarily.

30 A plastic film stretching device may be disposed at the path to stretch the plastic film and correct the print pitches individually. The plastic film stretching device can be used to stretch the plastic film and correct the

sum of print pitches.

Another aspect of the invention provides an apparatus for correcting print pitches at which a pattern is printed on a plastic film repeatedly, the plastic film capable of being fed longitudinally thereof, the apparatus  
5 comprising: an upstream optical sensor disposed at a path along which the plastic film can be fed, to detect positions at which the pattern is printed on the plastic film repeatedly; feeding rollers disposed at the path and  
10 downstream of the upstream optical sensor, the plastic film being fed by the feeding rollers; a plastic film stretching device disposed at the path and downstream of the upstream optical sensor, to stretch the plastic film; a downstream optical sensor disposed at the path and  
15 downstream of the feeding rollers and the plastic film stretching device and spaced from the upstream optical sensor at a distance corresponding to an integral multiple of reference value of print pitch, to detect the positions at which the pattern is printed on the plastic film  
20 repeatedly; and a control device arranged to receive detecting signals transmitted from the upstream and downstream optical sensors, the feeding rollers being operable by the control device in response to the detecting signals transmitted from the upstream optical  
25 sensor so that the plastic film can be fed intermittently for a length corresponding to the print pitch and stopped temporarily whenever being fed intermittently, the control device being further arranged to measure the print pitches individually to obtain measurement values in response to  
30 the detecting signals transmitted from the upstream optical sensor, the plastic film stretching device being operable by the control device to stretch the plastic film and correct the print pitches individually when the

measurement value is less than a reference value of print  
pitch to result in a difference exceeding a first  
predetermined value and when the plastic film is stopped  
temporarily, the control device being further arranged to  
5 measure a sum of print pitches of a number of patterns to  
obtain an additional measurement value in response to the  
detecting signals transmitted from the upstream and  
downstream optical sensors, the plastic film stretching  
device being operable by the control device to stretch the  
10 plastic film and correct the sum of print pitches when the  
additional measurement value is less than a reference  
value of sum of print pitches to result in a difference  
exceeding a second predetermined value and when the  
plastic film is stopped temporarily.

15

#### Brief Description of the Drawings

Embodiments of the invention will now be described,  
by way of example only, with reference to the accompanying  
non-limiting drawings.

20 Fig. 1 is a side view (A) of a preferred embodiment  
of the invention and a plan view (B) of the plastic film  
of (A).

Fig. 2 is an elevational view (A) of the first  
stretching device of Fig. 1 and a side view (B) of the  
25 rollers of (A).

Fig. 3 is a side view of a plastic bag making machine  
including the apparatus of Fig. 1.

Fig. 4 is a side view of another embodiment.  
Best Mode to Carry Out the Invention.

30 Embodiments of the invention are as follows.

Turning now to the drawings, Fig. 1 illustrates an  
apparatus for correcting print pitches P at which a  
pattern A is printed on a plastic film 1 repeatedly,

according to an embodiment of the invention. In the apparatus, the plastic film 1 is fed in a direction X and longitudinally thereof. The plastic film 1 includes the pattern A printed thereon repeatedly, with the print pitch P being predetermined. The print pitch P is compared with a reference value P0, as described later in detail. The plastic film 1 is fed intermittently for a length corresponding to the print pitch P and stopped temporarily whenever being fed intermittently.

10 The apparatus includes a first optical sensor disposed at a path along which the plastic film 1 is fed, and detecting positions at which the pattern A is printed on the plastic film 1 repeatedly, to measure the print pitches P individually. In the embodiment, an upstream optical sensor 2 is disposed at the path, the upstream optical sensor 2 detecting positions at which the pattern A is printed on the plastic film 1 repeatedly. For example, marks M are additionally printed on the plastic film 1 at the positions. A mark sensor is used as the upstream optical sensor 2 to detect the marks M or the positions. The first optical sensor comprises the upstream optical sensor 2 to measure the print pitches individually. The apparatus further includes feeding rollers 3 disposed at the path and downstream of the upstream optical sensor 2. The plastic film 1 is sandwiched between and fed by the feeding rollers 3 which are rotated by a drive motor. The feeding rollers 3 comprise rubber rollers.

30 The apparatus further includes a first stretching device 4 disposed at the path and downstream of the first optical sensor and stretching the plastic film 1 longitudinally thereof, after measuring the print pitch P and when the plastic film is stopped temporarily, to

correct the print pitches individually. In the embodiment, the first optical sensor comprises the upstream optical sensor 2, as described previously. The first stretching device 4 is therefore disposed at the path and downstream of the upstream optical sensor 2. In addition, the feeding rollers 3 are disposed at the path and downstream of the upstream optical sensor 2 while the first stretching device 4 is disposed at the path and downstream of the feeding rollers 3. The first stretching device 4 is spaced from the upstream optical sensor 2 at a distance, as also described later.

The first stretching device 4 comprises the device disclosed in Japanese Patent No. 4,461,201 and therefore includes rollers 5, as shown in Fig. 2. The plastic film 1 is fed longitudinally thereof and directed to a base 6. The rollers 5 are arranged widthwise of the plastic film 1, opposed to the plastic film 1 and the base 6 and supported by shafts 7 for rotation thereabout. The rollers 5 include tapered circumferential edges 8. The shafts 7 extend longitudinally of the plastic film 1. The first stretching device 4 further includes drive means by which the rollers 5 are moved and pushed downward so that the circumferential edges 8 should be pressed against the plastic film 1. In addition, the rollers 5 are moved widthwise of the plastic film 1 and rolled along the plastic film 1 to stretch the plastic film 1. The first stretching device 4 can select the number and type of rollers 5 to be moved downward, for adjustment of stretching amount of plastic film 1. It can increase the stretching amount to several times.

The apparatus further includes a second optical sensor disposed at the path along which the plastic film 1 is fed, and detecting the positions at which the pattern A

is printed on the plastic film 1 repeatedly, after  
correcting the print pitches  $P$ , to measure a sum of print  
pitches  $P(1)+P(2)+\dots+P(N)$  of a number of patterns  
A. In the embodiment, a downstream optical sensor 9 is  
5 disposed at the path and downstream of the upstream  
optical sensor 2 and spaced from the upstream optical  
sensor 9 at a distance corresponding to an integral  
multiple of reference value  $P_0$  of print pitch, the  
downstream optical sensor 9 detecting the positions at  
10 which the pattern A is printed on the plastic film 1  
repeatedly. For example, a mark sensor is used as the  
downstream optical sensor 9 to detect the marks M or the  
positions, as in the case of the upstream optical sensor  
2. The second optical sensor comprises the upstream and  
15 downstream optical sensors 2 and 9 to measure the sum of  
print pitches  $P(1)+P(2)+\dots+P(N)$ , as also described  
later.

The apparatus further includes a second stretching  
device 10 disposed at the path and stretching the plastic  
20 film 1 after measuring the sum of print pitches  $P(1)+P(2)$   
 $+ \dots + P(N)$  and when the plastic film 1 is stopped  
temporarily, to correct the sum of print pitches  $P(1)+P(2)$   
 $+ \dots + P(N)$ . In the embodiment, the downstream optical  
sensor 9 is disposed at the path and downstream of the  
25 first stretching device 4 while the second stretching  
device 10 is disposed at the path and downstream of the  
downstream optical sensor 9. The second stretching device  
10 has the same structure as the first stretching device 4  
and therefore includes the rollers to stretch the plastic  
30 film 1. It can also select the number and type of the  
rollers to be moved downward, for adjustment of stretching  
amount of plastic film 1. The plastic film 1 then passes

through dancer rollers 11 to be discharged.

The apparatus further includes a control device 12 connected to the upstream optical sensor 2, the feeding rollers 3, the first stretching device 4, the downstream optical sensor 9 and the second stretching device 10. The feeding rollers 3 are operated by the control device 12. The first and second stretching device 4 and 10 are also operated by the control device 12. In the embodiment, the feeding rollers 3 are rotated by the drive motor, as described previously. Accordingly, strictly speaking, the control device 12 is connected to the drive motor so that the feeding rollers 3 can be operated and rotated by the control device 12 and the drive motor. In addition, the first and second stretching devices 4 and 10 include the drive means by which the rollers 5 are moved to stretch the plastic film 1, as also described previously. The control device 12 is therefore connected to the drive means so that the rollers 5 can be operated and moved by the control device 12 and the drive means. The control device 12 comprises a computer.

In addition, the control device 12 is arranged to receive detecting signals transmitted from the upstream optical sensor 2. The feeding rollers 3 are operated by the control device 12 in response to the detecting signals transmitted from the upstream optical sensor 2 so that the plastic film 1 should be fed intermittently for the length corresponding to the print pitch  $P$  and stopped temporarily whenever being fed intermittently. The control device 12 is further arranged to measure the print pitches  $P$  individually to obtain measurement values in response to the detecting signals transmitted from the upstream optical sensor 2. The first stretching device 4 is operated by the control device 12 to stretch the plastic

film 1 and correct the print pitches  $P$  individually when the measurement value is less than the reference value  $P_0$  to result in a difference  $P_0 - P$  exceeding a first predetermined value, between the measurement value and the  
5 reference value  $P_0$ . In this connection, it should be understood that in general, the print pitch  $P$  is predetermined to be less than the reference value  $P_0$ . It therefore often happens when measuring the print pitches  $P$  individually to obtain the measurement values that the  
10 measurement value is less than the reference value  $P_0$ . The first stretching device is then operated to stretch the plastic film 1 and correct the print pitch when resulting in the difference  $P_0 - P$  exceeding the first predetermined value.

15 In the embodiment, an additional optical sensor 13 is disposed at the path and upstream of the upstream optical sensor 2 and spaced from the upstream optical sensor 2 at a distance corresponding to the print pitch  $P$  or an integral multiple thereof. The plastic film 1 passes  
20 through a dancer roller 14 to be directed to the additional optical sensor 13 and the upstream optical sensor 2, the additional optical sensor 13 and the upstream optical sensor 2 detecting the positions at which the pattern  $A$  is printed on the plastic film 1 repeatedly.  
25 For example, a mark sensor is used as the additional optical sensor 13 to detect the marks  $M$  or the positions. The first optical sensor comprises the upstream optical sensor 2 and the additional optical sensor 13 to measure the print pitches individually. In addition, the control  
30 device 12 is connected to the additional optical sensor 13 to receive detecting signals transmitted from the additional optical sensor 13. The control device 12 is

arranged to measure the print pitches P individually to obtain the measurement values in response to the detecting signals transmitted from the additional optical sensor 13 and the upstream optical sensor 2. In this case, the additional optical sensor 13 and the upstream optical sensor 2 can detect the positions at which the pattern A is printed on the plastic film 1 repeatedly, when the plastic film 1 is stopped temporarily, to measure the print pitches P individually. As a result, the apparatus can measure the print pitches P exactly. The measurement value is then stored in the control device 12 when being less than the reference value V0 to result in the difference  $P_0 - P$  exceeding the first predetermined value, the plastic film 1 including a portion concerned with the measurement value. The first stretching device 4 is then operated by the control device 12 to stretch the plastic film 1 and correct the print pitch P when the plastic film 1 is fed by the feeding rollers 3 and the concerned portion reaches the first stretching device 4.

The control device 12 is arranged to recognize if the print pitch P contains a short or excess correcting amount after correcting. The short or excess correcting amount is stored in the control device 12 and then cleared by the measurement value of next print pitch P to obtain a cleared value. The first stretching device 4 is operated by the difference between the cleared value, which is used as the measurement value, and the reference value P0.

For example, in the embodiment, the first stretching device 4 includes the rollers 5 for adjustment of stretching amount of plastic film 1, as described previously. It can increase the stretching amount to several times. The first stretching device 4 can

therefore stretch the plastic film 1 by a minimum stretching amount  $d$ , a double stretching amount  $2d$  or a triple stretching amount  $3d$ . In addition, in the first stretching device 4 stretching the plastic film 1 when  
5 resulting in the difference  $P_0 - P$  exceeding the first predetermined value, the first predetermined value comprises the minimum stretching amount  $d$  predetermined in the first stretching device 4. The first stretching device 4 therefore stretches the plastic film 1 to correct  
10 the print pitch  $P$  when resulting in the difference  $P_0 - P$  exceeding the minimum stretching amount  $d$ .

Furthermore, the print pitch  $P$  is predetermined to be less than the reference value  $P_0$  to result in a difference  $P_0 - P$  less than the double stretching amount  $2d$  of first  
15 stretching device 4 ( $P_0 - P = 0 \sim 2d$ ). The control device 12 is arranged to stretch the plastic film 1 by the minimum stretching amount  $d$  when resulting in the difference  $P_0 - P$  not exceeding the double stretching amount  $2d$  but exceeding the minimum stretching amount  $d$  after measuring  
20 the print pitch  $P$ . The control device 12 is further arranged to stretch the plastic film 1 by the double stretching amount  $2d$  when resulting in the difference  $P_0 - P$  not exceeding the triple stretching amount  $3d$  but exceeding the double stretching amount  $2d$ .

25 The control device 12 is further arranged not to stretch the plastic film 1 and correct the print pitch  $P$  when resulting in the difference  $P_0 - P$  not exceeding the minimum stretching amount  $d$ . The print pitch  $P$  must therefore be shortage by an uncorrected amount less than  
30 the minimum stretching amount  $d$  after correcting. Under the circumstances, the control device 12 is arranged to recognize if the print pitch  $P$  is shortage by the

uncorrected amount after correcting. The uncorrected amount is stored in the control device 12 and then subtracted from the measurement value of next print pitch P to obtain a subtracted value. The first stretching device 4 is operated by the difference between the subtracted value, which is used as the measurement value, and the reference value V0, to stretch the plastic film 1.

In addition, the control device 12 is arranged to stretch the plastic film 1 by the minimum stretching amount d when resulting in the difference  $P_0 - P$  not exceeding the double stretching amount 2d but exceeding the minimum stretching amount d, as described previously. It is also arranged to stretch the plastic film 1 by the double stretching amount 2d when resulting in the difference  $P_0 - P$  not exceeding the triple stretching amount 3d but exceeding the double stretching amount 2d. The print pitch P must therefore contain a short correcting amount after correcting. Under the circumstances, the control device 12 is arranged to recognize if the print pitch P contains the short correcting amount. The short correcting amount is stored in the control device 12 and then subtracted from the measurement value of next print pitch P to obtain a subtracted value. The first stretching device 4 is operated by the difference between the subtracted value, which is used as the measurement value, and the reference value P0, to stretch the plastic film 1.

The first predetermined value may comprise a predetermined amount less than the minimum stretching amount d of first stretching device 4. The first predetermined value may be small as much as possible. It may be zero. In this case, the first stretching device 4

stretches the plastic film 1 by the minimum stretching amount when resulting in the difference  $P_0 - P$  not exceeding the minimum stretching amount  $d$ . It stretches the plastic film 1 by the double stretching amount  $2d$  when resulting in the difference  $P_0 - P$  not exceeding the double stretching amount  $2d$  but exceeding the minimum stretching amount  $d$ . It stretches the plastic film 1 by the triple stretching amount  $3d$  when resulting in the difference  $P_0 - P$  not exceeding the triple stretching amount  $3d$  but exceeding the double stretching amount  $2d$ .

In this case, in contraries, the print pitch  $P$  must contain an excess correcting amount after correcting. The control device 12 is therefore arranged to recognize if the print pitch  $P$  contains the excess correcting amount. The excess correcting amount is stored in the control device 12 and then added to the measurement value of next print pitch  $P$  to obtain an added value. The first stretching device 4 is operated by the difference between the added value, which is used as the measurement value, and the reference value  $P_0$ .

In addition, the control device 12 is arranged to receive a detecting signal transmitted from the downstream optical sensor 9. The control device 12 is further arranged to measure the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  of the number of patterns  $A$  to obtain the additional measurement value in response to the detecting signals transmitted from the upstream and downstream optical sensors 2 and 9. The second stretching device 10 is operated by the control device 12 to stretch the plastic film 1 and correct the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  when the additional measurement value is less than a reference value  $P_0 \times N$  of sum of print

pitches to result in a difference  $S = \sum S_i$  exceeding a second predetermined value and when the plastic film 1 is stopped temporarily. The sum of print pitches  $P(1) + P(2) + \dots + P(N)$  exists between the upstream and downstream optical sensors 2 and 9. The reference value  $P_0 \times N$  exists between the upstream and downstream optical sensors 2 and 9. Strictly speaking, the measurement value is stored in the control device 12 when resulting in the difference  $S = \sum S_i$  exceeding the second predetermined value, the plastic film 1 including a portion concerned with the measurement. The second stretching device 10 is then operated by the control device 12 to stretch the plastic film 1 and correct the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  when the plastic film 1 is fed by the feeding rollers 3 and the concerned portion reach the second stretching device 10 and when the plastic film 1 is stopped temporarily.

The first stretching device 4 is spaced from the upstream optical sensor 2 at a distance corresponding to or less than the print pitch  $P$  of plastic film 1. In this situation, the additional optical sensor 13 and the upstream optical sensor 2 are used to measure the print pitches  $P$  individually, the plastic film 1 being fed by the feeding rollers 3, the first stretching device 4 stretching the plastic film 1 to correct the print pitches individually. The upstream and downstream optical sensors 2 and 9 are then used to measure the sum of print pitches  $P(1) + P(2) + \dots + P(N)$ . The sum of print pitches  $P(1) + P(2) + \dots + P(N)$  is therefore composed of the print pitches  $P$  interposed between the upstream and downstream optical sensors 2 and 9 for measurement after correcting respectively.

The print pitch  $P$  may be considerable small. In this case, it may be difficult to make the first stretching device 4 spaced from the upstream optical sensor at the distance corresponding to or less than the print pitch  $P$  of plastic film 1. The sum of print pitches  $P(1)+P(2)+\dots+P(N)$  can therefore not be composed of all of the print pitches  $P$  after correcting respectively. The sum of print pitches  $P(1)+P(2)+\dots+P(N)$  contains print pitches  $P$  before correcting. However, the additional optical sensor 13 and the upstream optical sensor 2 can measure the print pitches  $P$  of plastic film 1 to calculate the uncorrected amount thereof. The upstream and downstream optical sensors 2 and 9 can measure the sum of print pitches  $P(1)+P(2)+\dots+P(N)$  to obtain a provisional value. The uncorrected amount can then be added to the provisional value to be used as the measurement value.

In addition, the control device 12 is arranged to recognize if the sum of print pitches  $P(1)+P(2)+\dots+P(N)$  contains a short or excess correcting amount after correcting. The short or excess correcting amount is stored in the control device 12 and then cleared by the measurement value of next sum of print pitches  $P(1)+P(2)+\dots+P(N)$  to obtain a cleared value. The second stretching device 10 is operated by a difference  $S=\Sigma Si$  between the cleared value, which is used as the measurement value, and the reference value  $P0 \times N$ .

For example, in the embodiment, the second stretching device 10 includes the rollers 5 for adjustment of stretching amount of plastic film 1, as in the case of the first stretching device 4. The second stretching device

10 can stretch the plastic film 1 by a minimum stretching amount  $d$ , a double stretching amount  $2d$  or a triple stretching amount  $3d$ . In addition, in the second stretching device 10 stretching the plastic film 1 when  
 5 resulting in the difference  $S = \sum S_i$  exceeding the second predetermined value between the measurement value and the reference value  $P_0 \times N$ , the second predetermined value comprises the minimum stretching amount  $d$  predetermined in the second stretching device 10. The second stretching  
 10 device 10 therefore stretches the plastic film 1 to correct the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  when resulting in the difference  $S = \sum S_i$  exceeding the minimum stretching amount  $d$  predetermined in the second stretching device 10.

15 In addition, it is unusual that the difference  $S = \sum S_i$  exceeds the second predetermined value, between the measurement value and the reference value  $P_0 \times N$  when measuring the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  by reason that the first stretching device 4 stretches the  
 20 plastic film 1 to correct the print pitch  $P$ . In this connection, it should be understood that the second stretching device 10 does not stretch the plastic film 1 nor correct the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  when resulting in the difference  $S = \sum S_i$  not exceeding  
 25 the second predetermined value. The sum of print pitches  $P(1) + P(2) + \dots + P(N)$  must therefore be shortage by an uncorrected amount less than the minimum stretching amount  $d$ . Under the circumstances, the control device 12 is arranged to recognize if the sum of print pitches  $P(1) +$   
 30  $P(2) + \dots + P(N)$  is shortage by the uncorrected amount. The uncorrected amount is stored in the control device 12.

The uncorrected amount is then subtracted from the measurement value of next sum of print pitches  $P(1)+P(2)+\dots+P(N)$  to obtain a subtracted value. The second stretching device 10 is operated by a difference  $S=\sum Si$  between the subtracted value, which is used as the measurement value, and the reference value  $P0 \times N$ .

In addition, the control device 12 is arranged to stretch the plastic film 1 by the minimum stretching amount  $d$  when resulting in the difference  $S=\sum Si$  not exceeding the double stretching amount  $2d$  but exceeding the minimum stretching amount  $d$ , as described previously. It is also arranged to stretch the plastic film 1 by the double stretching amount  $2d$  when resulting in the difference  $S=\sum Si$  not exceeding the triple stretching amount  $3d$  but exceeding the double stretching amount  $2d$ . The sum of print pitches  $P(1)+P(2)+\dots+P(N)$  must therefore contain a short correcting amount after correcting. Under the circumstances, the control device 12 is arranged to recognize if the sum of print pitches  $P(1)+P(2)+\dots+P(N)$  contains the short correcting amount. The short correcting amount is stored in the control device 12 and then subtracted from the measurement value of next sum of print pitches  $P(1)+P(2)+\dots+P(N)$  to obtain a subtracted value. The second stretching device 10 is operated by a difference between the subtracted value, which is used as the measurement value, and the reference value  $P0 \times N$ , to stretch the plastic film 1.

The second predetermined value may comprise a predetermined amount less than the minimum stretching amount  $d$  of second stretching device 10. The second

predetermined value may be small as much as possible. It may be zero. In this case, the second stretching device 10 stretches the plastic film 1 by the minimum stretching amount  $d$  when resulting in the difference  $S = \sum Si$  not

5 exceeding the minimum stretching amount  $d$ . It stretches the plastic film 1 by the double stretching amount  $2d$  when resulting in the difference  $S = \sum Si$  not exceeding the double stretching amount  $2d$  but exceeding the minimum stretching amount  $d$ . It stretches the plastic film 1 by the triple

10 stretching amount  $3d$  when resulting in the difference  $S = \sum Si$  not exceeding the triple amount  $3d$  but exceeding the double stretching amount  $2d$ .

In this case, in contraries, the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  must contain an excess correcting

15 amount after correcting. The control device is therefore arranged to recognize if the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  contains the excess correcting amount. The excess correcting amount is stored in the control

20 device 12 and then added to the measurement value of next sum of print pitches  $P(1) + P(2) + \dots + P(N)$  to obtain an added value. The second stretching device 10 is operated by the difference between the added value, which is used as the measurement value, and the reference value  $P_0 \times N$ .

The second stretching device 10 may be disposed to

25 stretch the plastic film 1 at any portion concerned with the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  after measuring. It may be arranged to stretch the plastic film 1 once at the same portion or two or three times at two or three portions when stretching it by the double or triple

30 stretching amount.

The apparatus may be arranged to measure the sum of

print pitches  $P(1)+P(2)+\dots+P(N)$  whenever the plastic film 1 is fed intermittently. It may be arranged to measure the sum of print pitches  $P(1)+P(2)+\dots+P(N)$  whenever the plastic film 1 is fed intermittently several  
5 times. It may be arranged to measure the sum of print pitches  $P(1)+P(2)+\dots+P(N)$  whenever the plastic film 1 is fed intermittently a number of times corresponding to the print pitches  $P(1)+P(2)+\dots+P(N)$  in the sum.

In the embodiment, there is used a plurality of the  
10 apparatuses 15 for correcting print pitches P at which patterns A are printed on plastic films 1 repeatedly, as shown in Fig. 3. The apparatuses are incorporated in a machine including guide rollers 16, feeding rollers 17, a heat seal device 18 and 19 and a cross cutter 20. The  
15 plastic films 1 are directed to the guide rollers 16 to be superposed with each other after correcting the print pitches P. The plastic films 1 are then directed to the feeding rollers 17 by which the plastic films 1 is fed intermittently for a length corresponding to the print  
20 pitch P and stopped temporarily whenever being fed intermittently. In addition, the plastic films 1 are heat sealed with each other by the heat seal device 18 and 19 and cross cut by the cross cutter 20 whenever being fed intermittently and when stopped temporarily, to  
25 successively make plastic bags. For example, the heat seal device comprises longitudinal and cross seal devices 18 and 19. The plastic films 1 are heat sealed by the longitudinal seal device 18 longitudinally thereof and heat sealed by the cross seal device 19 widthwise of the  
30 plastic films 1. The plastic films 1 are then cross cut by the cross cutter 20 to successively make the plastic bags.

Accordingly, in the apparatus, the additional optical sensor 13 and the upstream optical sensor 2 are used to measure the print pitches  $P$  individually. The first stretching device 4 then stretches the plastic film 1 after measuring the print pitches  $P$ , to correct the print pitches  $P$  individually. It is intended to correct the print pitch  $P$  toward the reference value  $P_0$ .

In addition, the upstream and downstream optical sensors 2 and 9 are used to measure the sum of print pitches  $P(1)+P(2)+\dots+P(N)$  of a number of patterns  $A$  after correcting the print pitches  $P$ . The second stretching device 10 then stretches the plastic film 1 after measuring the sum of print pitches  $P(1)+P(2)+\dots+P(N)$ , to correct the sum of print pitches  $P(1)+P(2)+\dots+P(N)$ , if necessary.

The apparatus can therefore correct the print pitches  $P$  in a two-stage process. As a result, the apparatus can correct the print pitches  $P$  individually and exactly to keep them at the reference value  $P_0$  or a fixed value.

The apparatus can therefore overcome the problem of discrepancy in pattern between the plastic films 1 due to the accumulated errors of print pitches when being incorporated in the machine for successively making the plastic bags. In the machine, the plastic films 1 are superposed with each other, heat sealed with each other by the heat seal device 18 and 19 and then cross cut by the cross cutter 20, to successively make the plastic bags. The apparatus can further overcome the problem of print pitch fluctuated to make the plastic bag have a size changed, described previously in connection with the apparatus of Japanese Patent No. 4,121,722. In addition, the heat seal devices 18 and 19 and the cross cutter 20

have not to be moved by a drive means for adjustment of position, not resulting in technical problems.

In another embodiment of Fig. 4, the additional optical sensor 13, the upstream optical sensor 2 and the feeding rollers 3 are disposed at the path along which the plastic films 1 are fed, as in the case of the embodiment of Fig. 1. However, the first and second stretching device comprises a single stretching device 21 disposed at the path and downstream of the upstream optical sensor 2 and feeding rollers 2. The downstream optical sensor 9 is disposed at the path and downstream of the single stretching device 21. The single stretching device 21 comprises a plastic film stretching device stretching the plastic film 1 longitudinally thereof. The plastic film stretching device 21 has the same structure as the devices 4 and 10 of Fig. 1. The plastic film stretching device can therefore stretch the plastic film 1 by the minimum stretching amount  $d$ , the double stretching amount  $2d$  or the triple stretching amount  $3d$ .

The downstream optical sensor 9 is spaced from the upstream optical sensor 2 at the distance corresponding to the integral multiple of reference value  $P_0$  of print pitch. The control device 12 is connected to the additional optical sensor 13, the upstream optical sensor 2, the feeding rollers 3, the plastic film stretching device 21 and the downstream optical sensor 9.

In addition, the control device 12 receives the detecting signals transmitted from the upstream optical sensor 2. The feeding rollers 3 are operated by the control device 12 in response to the detecting signals transmitted from the upstream optical sensor 2 so that the plastic films 1 should be fed intermittently for the length corresponding to the print pitch  $P$  and stopped

temporarily whenever being fed intermittently. The control device 12 further receives the detecting signals transmitted from the additional optical sensor 13. The control device 12 then measures the print pitches P  
5 individually to obtain the measurement values in response to the detecting signals transmitted from the additional optical sensor 13 and the upstream optical sensor 2. The plastic film stretching device 21 is operated by the control device 12 to stretch the plastic film 1 and  
10 correct the print pitches P individually when the measurement value is less than the reference value  $P_0$  to result in the difference  $P_0 - P$  exceeding the first predetermined value and when the plastic film 1 is stopped temporarily. The first predetermined value comprises the  
15 minimum stretching amount  $d$  of plastic film stretching device 21. The first predetermined value may comprise the predetermined value less than the minimum stretching amount  $d$  of plastic film stretching device 21. The first predetermined value may be small as much as possible. It  
20 may be zero, as also in the embodiment of Fig. 1.

Furthermore, the control device 12 receives the detecting signals transmitted from the downward optical sensor 9. The control device 12 then measures the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  of the number of  
25 patterns A to obtain the additional measurement value in response to the detecting signals transmitted from the upstream and downstream optical sensors 2 and 9. The plastic film stretching device 21 is operated by the control device 12 to stretch the plastic film 1 and  
30 correct the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  when the additional measurement value is less than the reference value  $P_0 \times N$  of sum of print pitches to result in

the difference  $S = \sum S_i$  exceeding the second predetermined value and when the plastic film 1 is stopped temporarily. The second predetermined value comprises the minimum stretching amount  $d$  of plastic film stretching device 21.

5 The second predetermined value may comprise the predetermined amount less than the minimum stretching amount  $d$  of plastic film stretching device 21. The second predetermined value may be small as much as possible. It may be zero.

10 In the apparatus of Fig. 4, the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  is composed of the print pitches  $P$  interposed between the upstream and downstream optical sensors 2 and 9 for measurement after correcting respectively. The sum of print pitches  $P(1) + P(2) + \dots + P(N)$  may contain print pitches  $P$  before correcting. In  
 15 this case, the upstream and downstream optical sensors 2 and 13 may measure the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  to obtain a provisional value. The uncorrected amount is then be added to the provisional amount to be  
 20 used as the measurement value.

The plastic film stretching device 21 may stretch the plastic film 1 to correct the print pitches  $P$  or the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  after the additional optical sensor 13 and the upstream optical  
 25 sensor 2 measure the print pitches  $P$  of plastic film 1 or the upstream and downstream optical sensors 2 and 9 measure the sum of print pitches  $P(1) + P(2) + \dots + P(N)$ . The plastic film stretching device 21 may be intended to correct the print pitch  $P$  and the sum of print pitches  
 30  $P(1) + P(2) + \dots + P(N)$  at the same time.

In the apparatus of Fig. 4, the control device 12 is

arranged to recognize if the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  contains a short or excess correcting amount after correcting. The short or excess correcting amount is stored in the control device 12 and then cleared  
 5 by the measurement value of next sum of print pitches  $P(1) + P(2) + \dots + P(N)$  to obtain the cleared value. The plastic film stretching device 21 is operated by the difference  $S = \sum S_i$  between the cleared value, which is used as the measurement value, and the reference value  $P_0 \times N$ .

10 For example, the sum of print pitches  $P(1) + P(2) + \dots + P(N)$  may contain the short correcting amount, after correcting. In this case, the short correcting amount is subtracted from the measurement value of next sum of print pitches  $P(1) + P(2) + \dots + P(N)$  to obtain the subtracted  
 15 value. The plastic film stretching device 21 is operated by the difference  $S = \sum S_i$  between the subtracted value, which is used as the measurement value, and the reference value  $P_0 \times N$ . The sum of print pitches  $P(1) + P(2) + \dots + P(N)$  may contain the excess correcting amount, after  
 20 correcting. In this case, the excess correcting amount is added to the measurement value of next sum of print pitches  $P(1) + P(2) + \dots + P(N)$  to obtain the added value. The plastic film stretching device 21 is operated by the difference  $S = \sum S_i$  between the added value, which is used as  
 25 the measurement value, and the reference value  $P_0 \times N$ .

The sum of print pitches  $P(1) + P(2) + \dots + P(N)$  may be shortage by the uncorrected amount less than the minimum stretching amount  $d$ . In this case, the uncorrected amount should be subtracted from the  
 30 measurement value of next sum of print pitches  $P(1) + P(2) + \dots + P(N)$  to obtain the subtracted value. The plastic

film stretching device 21 is operated by the difference  $S = \sum S_i$  between the subtracted value, which is used as the measurement value, and the reference value  $P_0 \times N$ .

The apparatus may be arranged to measure the sum of  
 5 print pitches  $P(1) + P(2) + \dots + P(N)$  whenever the plastic  
 film 1 is fed intermittently. It may be arranged to  
 measure the sum of print pitches  $P(1) + P(2) + \dots + P(N)$   
 whenever the plastic film 1 is fed intermittently several  
 times. It may be arranged to measure the sum of print  
 10 pitches  $P(1) + P(2) + \dots + P(N)$  whenever the plastic film  
 1 is fed intermittently a number of times corresponding to  
 the print pitches  $P(1) + P(2) + \dots + P(N)$  in the sum.

A plurality of the apparatuses are incorporated in a  
 machine in which plastic films 1 are superposed with each  
 15 other after correcting the print pitches  $P$ , as in the case  
 of the embodiment of Figs. 1 to 3. The plastic films 1  
 are heat sealed with each other by the heat seal device  
 and then cross cut by the cross cutter to successively  
 make the plastic bags.

20 Accordingly, in the apparatus of Fig. 4, the plastic  
 film stretching device 21 stretches the plastic film 1  
 after measuring the print pitches  $P$ , to correct the print  
 pitches  $P$  individually. In addition, the upstream and  
 downstream optical sensors 2 and 9 are used to measure the  
 25 sum of print pitches  $P(1) + P(2) + \dots + P(N)$  of the number  
 of patterns  $A$  after correcting the print pitches  $P$ . The  
 plastic film stretching device 21 then stretches the  
 plastic film 1 to correct the sum of print pitches  $P(1) +$   
 $P(2) + \dots + P(N)$ , if necessary. The apparatus can  
 30 therefore correct the print pitches  $P$  in a two-stage  
 process.

As a result, the apparatus can correct the print pitches P individually and exactly to keep them at the reference value P0 or a fixed value.

In the claims which follow and in the preceding  
5 description of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense,  
10 i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the invention.

It is to be understood that, if any prior art publication is referred to herein, such reference does not  
15 constitute an admission that the publication forms a part of the common general knowledge in the art, in Australia or any other country.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An apparatus for correcting print pitches at which a pattern is printed on a plastic film repeatedly,  
5 the apparatus comprising:

feeding rollers by which the plastic film can be fed intermittently for a length corresponding to the print pitch and stopped temporarily whenever being fed intermittently;

10 a first optical sensor disposed at a path along which the plastic film is fed intermittently, and for detecting positions at which the pattern is printed on the plastic films repeatedly, to measure the print pitches individually;

15 a first stretching device disposed at the path and downstream of the first optical sensor that can stretch the plastic film after measuring the print pitch and when the plastic film is stopped temporarily, to correct the print pitches individually;

20 a second optical sensor disposed at the path that can detect the positions after correcting the print pitches, to measure a sum of print pitches of a number of patterns; and

25 a second stretching device disposed at the path that can stretch the plastic film after measuring the sum of print pitches and when the plastic film is stopped temporarily, to correct the sum of print pitches.

30 2. The apparatus as set forth in claim 1 further comprising a control device arranged to measure the print pitches individually and obtain measurement values in response to detecting signals transmitted from the first optical sensor, the first stretching device being operable by the control device to stretch the plastic film and

correct the print pitch when the measurement value is less than a reference value to result in a difference exceeding a predetermined value, between the measurement value and the reference value.

5           3. The apparatus as set forth in claim 2 wherein the control device is arranged to recognize if the print pitch contains a short or excess correcting amount after correcting, the short or excess correcting amount being stored in the control device and then cleared by the  
10 measurement value of next print pitch to obtain a cleared value, the first stretching device being operable by the difference between the cleared value, which is used as the measurement value, and the reference value.

15           4. The apparatus as set forth in claim 2 wherein the predetermined value comprises a minimum stretching amount predetermined in the first stretching device, the first stretching device being operable by the control device to stretch the plastic film when the measurement value is less than the reference value to result in the difference  
20 exceeding the minimum stretching amount, the control device being arranged to recognize if the print pitch is shortage by an uncorrected amount less than the minimum stretching amount after correcting, the uncorrected amount being stored in the control device and then subtracted  
25 from the measurement value of next print pitch to obtain a subtracted value, the first stretching device being operable by the difference between the subtracted value, which is used as the measurement value, and the reference value.

30           5. The apparatus as set forth in any one of claims 1 to 4 further comprising a control device arranged to measure the sum of print pitches of the number of patterns to obtain a measurement value in response to a detecting

signal transmitted from the second optical sensor, the second stretching device being operable by the control device to stretch the plastic film and correct the sum of print pitches when the measurement value is less than a  
5 reference value to result in a difference exceeding a predetermined value, between the measurement value and the reference value.

6. The apparatus as set forth in claim 5 wherein the control device is arranged to recognize if the sum of  
10 print pitches contains a short or excess correcting amount after correcting, the short or excess correcting amount being stored in the control device and then cleared by the measurement value of next sum of print pitches to obtain a cleared value, the second stretching device being operable  
15 by the difference between the cleared value, which is used as the measurement value, and the reference value.

7. The apparatus as set forth in claim 5 or 6 wherein the predetermined value comprises a minimum stretching amount predetermined in the second stretching  
20 device, the second stretching device being operable by the control device to stretch the plastic film when the measurement value is less than the reference value to result in the difference exceeding the minimum stretching amount, the control device being arranged to recognize if  
25 the sum of print pitches is short by an uncorrected amount less than the minimum stretching amount after correcting, the uncorrected amount being stored in the control device and then subtracted from the measurement value of next sum of print pitches to obtain a subtracted value, the second  
30 stretching device being operable by the difference between the subtracted value, which is used as the measurement value, and the reference value.

8. The apparatus as set forth in any one of claims 1

to 7 wherein an upstream optical sensor is disposed at the path, a downstream optical sensor being disposed at the path and downstream of the upstream optical sensor and spaced from the upstream optical sensor at a distance  
5 corresponding to an integral multiple of reference value of print pitches, the upstream and downstream optical sensors can detect the positions at which the pattern is printed on the plastic film repeatedly, the first optical sensor comprising the upstream optical sensor to measure  
10 the print pitches individually, the second optical sensor comprising the upstream and downstream optical sensors to measure the sum of print pitches of the number of patterns.

9. The apparatus as set forth in claim 8 wherein an  
15 additional optical sensor is disposed at the path and upstream of the upstream optical sensor and spaced from the upstream optical sensor at a distance corresponding to the print pitch or an integral multiple thereof, the additional optical sensor can detect the positions at  
20 which the pattern is printed on the plastic film repeatedly, the first optical sensor comprising the upstream optical sensor and the additional optical sensor to measure the print pitches individually.

10. The apparatus as set forth in claim 8 or 9  
25 wherein the first stretching device is disposed downstream of the upstream optical sensor, the downstream optical sensor being disposed downstream of the first stretching device, the second stretching device being disposed downstream of the downstream optical sensor.

30 11. The apparatus as set forth in claim 8 or 9 wherein the first and second stretching devices comprise a single stretching device disposed downstream of the upstream optical sensor, the downstream optical sensor

being disposed downstream of the single stretching device.

12. The apparatus as set forth in claim 8 wherein the feeding rollers are disposed at the path and downstream of the upstream optical sensor, the feeding  
5 rollers being operable by a control device in response to the detecting signals transmitted from the upstream optical sensor so that the plastic film can be fed intermittently for the length corresponding to the print pitch.

10 13. The apparatus as set forth in any one of claims 1 to 12 wherein the apparatus is incorporated in a machine including a heat seal device and a cross cutter, wherein the plastic films can be superposed with each other after correcting the print pitches, the plastic films can then  
15 be heat sealed with each other by the heat seal device and cross cut by the cross cutter, to successively make plastic bags.

14. An apparatus for correcting print pitches at which a pattern is printed on a plastic film repeatedly,  
20 the plastic film capable of being fed longitudinally thereof, the apparatus comprising:

an upstream optical sensor disposed at a path along which the plastic film can be fed, to detect positions at which the pattern is printed on the plastic  
25 film repeatedly;

feeding rollers disposed at the path and downstream of the upstream optical sensor, the plastic film capable of being fed by the feeding rollers;

30 a first stretching device disposed at the path and downstream of the upstream optical sensor, to stretch the plastic film;

a downstream optical sensor disposed at the path and downstream of the feeding rollers and the first

stretching device and spaced from the upstream optical sensor at a distance corresponding to an integral multiple of reference value of print pitch, to detect the positions at which the pattern is printed on the plastic film  
5 repeatedly;

a second stretching device disposed at the path and downstream of the downstream optical sensor, to stretch the plastic film; and

a control device arranged to receive detecting  
10 signals transmitted from the upstream and downstream optical sensors, the feeding rollers being operable by the control device in response to the detecting signals transmitted from the upstream optical sensor so that the plastic film can be fed intermittently for a length  
15 corresponding to the print pitch and stopped temporarily whenever being fed intermittently, the control device being further arranged to measure the print pitches individually to obtain measurement values in response to the detecting signals transmitted from the upstream  
20 optical sensor, the first stretching device being operable by the control device to stretch the plastic film and correct the print pitches individually when the measurement value is less than a reference value of print pitch to result in a difference exceeding a first  
25 predetermined value and when the plastic film is stopped temporarily, the control device being further arranged to measure a sum of print pitches of a number of patterns to obtain an additional measurement value in response to the detecting signals transmitted from the upstream and  
30 downstream optical sensors, the second stretching device being operable by the control device to stretch the plastic film and correct the sum of print pitches when the additional measurement value is less than a reference

value of sum of print pitches to result in a difference exceeding a second predetermined value and when the plastic film is stopped temporarily.

15           15. An apparatus for correcting print pitches at which a pattern is printed on a plastic film repeatedly, the plastic film capable of being fed longitudinally thereof, the apparatus comprising:

                  an upstream optical sensor disposed at a path along which the plastic film can be fed, to detect  
10 positions at which the pattern is printed on the plastic film repeatedly;

                  feeding rollers disposed at the path and downstream of the upstream optical sensor, the plastic film being fed by the feeding rollers;

15                   a plastic film stretching device disposed at the path and downstream of the upstream optical sensor, to stretch the plastic film;

                  a downstream optical sensor disposed at the path and downstream of the feeding rollers and the plastic film stretching device and spaced from the upstream optical  
20 sensor at a distance corresponding to an integral multiple of reference value of print pitch, to detect the positions at which the pattern is printed on the plastic film repeatedly; and

25                   a control device arranged to receive detecting signals transmitted from the upstream and downstream optical sensors, the feeding rollers being operable by the control device in response to the detecting signals transmitted from the upstream optical sensor so that the  
30 plastic film can be fed intermittently for a length corresponding to the print pitch and stopped temporarily whenever being fed intermittently, the control device being further arranged to measure the print pitches

individually to obtain measurement values in response to the detecting signals transmitted from the upstream optical sensor, the plastic film stretching device being operable by the control device to stretch the plastic film and correct the print pitches individually when the measurement value is less than a reference value of print pitch to result in a difference exceeding a first predetermined value and when the plastic film is stopped temporarily, the control device being further arranged to measure a sum of print pitches of a number of patterns to obtain an additional measurement value in response to the detecting signals transmitted from the upstream and downstream optical sensors, the plastic film stretching device being operable by the control device to stretch the plastic film and correct the sum of print pitches when the additional measurement value is less than a reference value of sum of print pitches to result in a difference exceeding a second predetermined value and when the plastic film is stopped temporarily.

20

FIG. 1

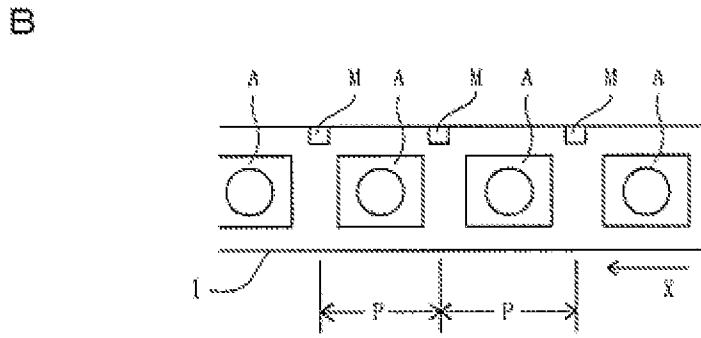
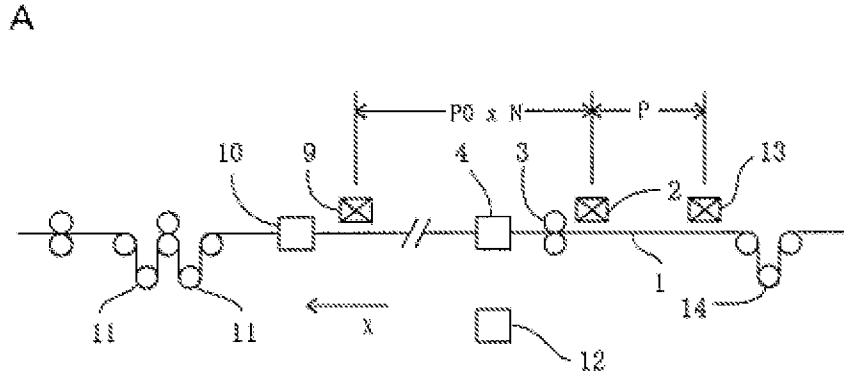
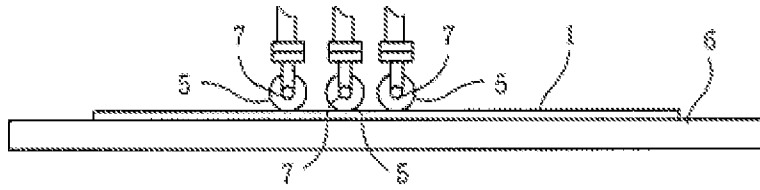


FIG. 2

A



B

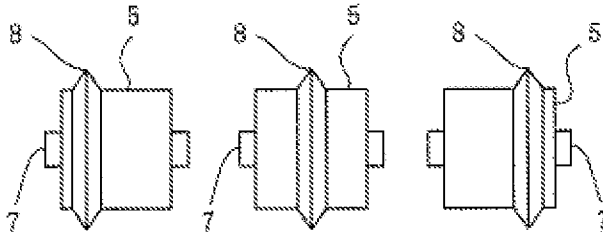


FIG. 3

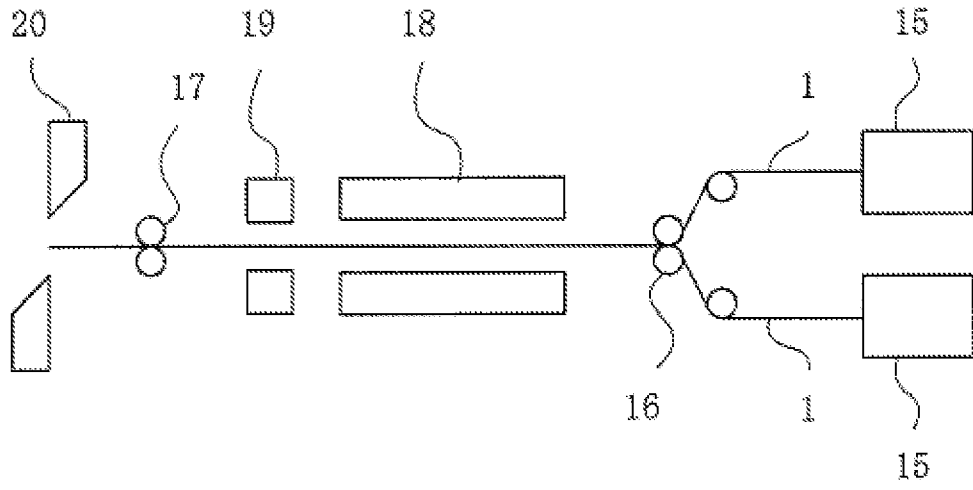


FIG. 4

