

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

**EP 0 653 352 B1**

(12)

## EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention  
of the grant of the patent:  
**13.08.1997 Bulletin 1997/33**

(51) Int. Cl.<sup>6</sup>: **B65B 11/04**

(21) Application number: **94850205.9**

(22) Date of filing: **17.11.1994**

**(54) Incrementally variable transmission between prestretching rollers in a stretch-film wrapping machine**

Schrittweise verstellbares Getriebe zwischen Vorstreckungswalzen in einer Maschine zum Umhüllen mit streckbarer Folie

Transmission variable par incréments entre des rouleaux de pré-étirage dans une machine d'emballage à film étirable

(84) Designated Contracting States:  
**BE DE DK ES FR GB IT NL**

(30) Priority: **17.11.1993 SE 9303804**

(43) Date of publication of application:  
**17.05.1995 Bulletin 1995/20**

(73) Proprietor: **BURTECH AB**  
**S-330 26 Burseryd (SE)**

(72) Inventor: **Idh, Jan**  
**S-151 90 Södertälje (SE)**

(74) Representative: **Kierkegaard, Lars-Olov et al**  
**H. Albihns Patentbyrå AB,**  
**P.O. Box 3137**  
**103 62 Stockholm (SE)**

(56) References cited:  
**EP-A- 0 220 712** **FR-A- 2 544 702**  
**FR-A- 2 606 365** **US-A- 4 336 679**

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

**EP 0 653 352 B1**

## Description

The invention relates to a stretch-film wrapping machine with an incrementally variable transmission for transmission of a torque between input and output rollers in a prestretching device for a stretch-film wrapping machine, to achieve selected prestretching of a plastic film with a predetermined yield point. The input roller is caused to rotate at lower rpm than the output roller. The transmission comprises a shifting mechanism arranged in a housing with various gearing increments between an input and an output shaft, and has a device for engaging and disengaging the input shaft to or from the shifting mechanism.

Stretch-film wrapping machines with prestretching for stationary or rotating goods according to the preamble of Claim 1 are known and an illustration is described in US-A-4,336,679. Stretch-film, possibly supplemented with top-film or topsheets, can provide a universal protecting covering for the goods at the same time as non-uniform goods are held together. Stretch-film wrapping is a good protector for foodstuffs and chemical technical products, for example.

A known stretch-film wrapping machine comprises essentially a film roll or thin plastic film, e.g. a cast film of 20  $\mu$ , a prestretching device comprising two parallel rollers, which are caused to rotate at different rpm, and a driven rotatable turntable which supports the goods to be wrapped and which are suitably stacked on a pallet. The first roller, to which the film comes from the plastic film roll, is caused to rotate at relatively low rpm, e.g. 10 rpm, and this determines the speed at which the film will leave the film roll. The second roller, via which the film after prestretching leaves the prestretching device, is caused to rotate in the opposite direction, and at a higher rpm than the first roller, e.g. 30 rpm, depending on the speed at which the film is wrapped around the goods. Since the rollers have friction-increasing elements and/or coatings on their surfaces and the plastic film runs in an S-shape in contact with the counter-rotating rollers, the film will leave the prestretching device at a higher speed than the feeding speed. This achieves a prestretching of the film in the transition portion between the two rollers which results in a film thickness of about 3  $\mu$ , which is desirable for economic reasons among other things.

In order to reduce the risk of film breakage in the space between the prestretching device and the goods, it is suitable to equip the machine with a drive device, in the form of an electric motor for example, which supplies a positive torque to the rollers and thus brings the film tension down to very small values.

In order to make it possible to adapt the machine to plastic films of varying thickness and quality, it is desirable to be able to change the transmission ratio between the rollers. A known solution is to arrange a transmission with a fixed set of gears between the roller shafts, but this solution requires an unreasonable amount of work since the transmission ratio can only be changed

by replacing the gears. It is also known to arrange a gear transmission with fixed ratio increments and a number of gears on each roller shaft, thus permitting three selectable transmission ratios between the shafts. Via a clutch, the input roller can be engaged or disengaged from the gear transmission. Alternatively, a belt transmission with continuously variable transmission ratio between the shafts is used. In this case it is, however, difficult to find a command value as a starting value for a certain transmission ratio, which experientially provides a suitable prestretching of a film with known properties. It is also known to impart a positive torque to the input roller by means of a torque device and a standard reduction gear train. Thus, the tensile force in the film web will be less between the output roller and the goods than between the rollers in the prestretching device.

The known devices are unsatisfactory in their function because they are complicated and bulky, have few feed steps or have a continuously variable transmission and must be stopped or disassembled for resetting. There is also lacking automatic release of the input roller from the transmission, the output roller and in applicable cases from the torque device if there is a break in the film, which can result in time-consuming downtime due to the fact that the film will be wrapped around the rollers.

The purpose of the present invention is therefore to provide an integrated transmission unit which does not have the above mentioned disadvantages, which is simple to manufacture at low cost, can be easily shifted between a large number of transmission steps and has automatic release of the input roller when there is extremely low film tension or film breakage.

This is achieved according to the invention by virtue of the fact that the transmission comprises a gear unit and a clutch device, that the input and output shafts of the gear unit are coaxial, that the clutch device is a one-way clutch which is in engagement when the input roller is imparted, by means of the tension in the film between the rollers, a torque from the output roller, and that the clutch assumes its free-wheeling position when said torque is not present.

Advantageous further developments and improvements of the invention are possible by the steps disclosed in the dependent claims.

A preferred embodiment of the invention is shown in the accompanying drawings and will be described in more detail in the following description.

Figure 1 shows the principle of a transmission in a prestretching device,

Figure 2 shows schematically a gear means provided with a free-wheel and a drive device, mounted in a partially cut-away prestretching device,

Figure 3 is a diagram which shows the achievable

prestretching with a motor-driven prestretching device, and

Figure 4 is a diagram showing the achievable prestretching with a non-driven prestretching device.

According to the preferred embodiment of the invention, the stretch-film wrapping machine has a prestretching device 2, which has an input roller 4 and an output roller 6, said rollers having parallel shafts. The rollers are rotatably mounted in a frame 8 and are coupled to each other by means of a reduction gear 14 of conventional type, consisting of a large gear 10 and a small gear 12, and by means of a transmission unit 16 with variable transmission ratios. For the sake of clarity, the rollers are shown here not in their entirety but only partially and, as regards the input shaft, only very schematically, since this roller is of a commonly occurring type and the transmission unit 16 is mounted on the output roller 6. The rollers are rotatably mounted in their respective ends and have essentially the same diameter. The circumference of each roller is provided with a friction-increasing element (not shown) or coating, to provide better grip between the rollers and the plastic film.

The transmission unit 16 is in the form of a housing 18 and has a planetary gear train 22 engageable with a free-wheel clutch 20 as well as a pulley 24. The housing 18 has two cylindrical concentric inter-engaging components, an outer component 26 which also serves as the output shaft of the planetary gear train 22 and an inner housing component 28, to which the gear 12 is fixed. The inner housing component serves as an input shaft to the planetary gear train. The free-wheel clutch 20 and the planetary gear train 22 are housed in the housing 18. The planetary gear train has a central through-shaft 30 which is concentrically disposed in the housing 18 and has two shaft ends 32,34 which extend from either end piece 36,38, located in a free end of the respective components 26,28. The shaft end 32 extending from the inner housing component is fixed by means of a lock screw 40 in an opening in a mounting plate 44 anchored on the frame 8 via a bracket 42. The shaft end 34 extending from the opposite end piece 38 of the housing 18 is threaded and screwed into a corresponding thread in one end of a rod shaft 46, which extends through the center of the output roller 6 mounted rotatably on the same. The end piece 38 and the housing 26 are rotatable relative to each other. The thread of the pin 34 is locked to the thread of the rod shaft 46 by lock nuts 48, which also prevent the end piece 34 from being rotated relative to the shaft end and the rod shaft. The other end of the rod shaft 46 is screwed securely by means of a screw fastener 50 to the lower portion of the frame 8. The housing component 26 has an annular flange 52 disposed close to the outer end adjacent the end piece 38, on which flange the upper end of the output roller 6 is screwed. An annular gap 54 close to the upper end of

the roller 6 assures that the roller and the rod shaft will be free of each other. Thus, the housing component 26 with the flange 52 and output roller 6 will be rotatable relative to the shaft end 34 fixed in the frame 8 and the housing end piece 38. The end of the rod shaft 46 mounted in the lower portion of the frame 8 is coupled via a bearing 56 of conventional type, e.g. a journal bearing, a ball bearing or a roller bearing, with the lower portion of the roller 6. A driving device 58 for driving the prestretching device 2 at a predetermined rpm during a predetermined time interval comprises a conventional electric motor (not shown), which is connected via a drive belt (not shown) to the pulley 24 mounted on the periphery of the housing component 26.

The stretch-film wrapping machine also has a sensor (not shown) which regulates, via a computer control, the rpm of the drive motor depending on the speed at which the plastic film is wrapped around the goods, and which senses whether the film is intact and stops the drive motor if the film breaks.

In the transmission unit 16 there can be used with advantage a bicycle hub with seven gear speeds and a free-wheel arrangement. Therefore the design of the bicycle hub will not be discussed in more detail here with a planetary gear train and a free-wheel. The bicycle hub need only be modified by replacing the sprocket with the gear 12, removing one spoke flange (the other serves as the annular flange 52) and by mounting the pulley 24 around the outer component 26 of the bicycle hub. The bicycle hub is mounted as described above by anchoring each shaft end 32,34 in the frame 8 of the prestretching device 2 and by screwing the upper end of the roller 6 to the annular flange 52.

The stretch-film wrapping machine with the prestretching device 2 according to the invention functions as follows. In normal operation without the motor engaged, the tension in the film, which is generated when the goods on the turntable is rotated, strives to turn the two rollers 4,6 at the same rpm, provided they have the same outer diameter. The reduction gear train 14 forces, however, the input roller 4 to rotate at a lower rpm than the output roller 6. A suitable value of the gear ratio in the reduction gear train is 1:3. In the transmission unit 16, a one-way clutch 20 is mounted between the gear 12 and the planetary gear train 22 on the output roller 6 in such a manner that the one-way clutch is in engagement when the input roller 4 via its gear 10, the reduction gear train 14 and the planetary gear train 22 strives to "push" the output roller 6. For this reason and due to the film tension and the gear ratio, the input roller is "braked" and rotates at a given speed ratio as long as the planetary gear train 22 transmits the rotation of the gear 12 unchanged to the roller 6. The plastic film is thus prestretched between the rollers but this is sufficient only for a certain film with specific properties. By means of the planetary gear train 22 it is, however, possible to change the gear ratio between the gear 12 and the output roller 6 within a range of -41% to +69% in seven increments. Thus, the prestretching can be both

optimized for plastic film of varying thickness and quality and be varied for increased utility of films with certain specific properties.

A film with a thickness of approximately 3  $\mu$  can, however, be easily torn off, especially since the tensile force exerted by the pallet goods is not even but is pulsating. In order to reduce the risk of film breakage, it is therefore advantageous to engage the drive device 58, whereby the film tension is minimized between the prestretching device 2 and the pallet goods. In a motor-driven prestretching device, it is also possible to achieve further stretching of the film. Figure 3 shows the achievable degree of stretching with motor operation, as a function of the selected gear. It is evident from the diagram that a plastic film of the same quality as a cast film of 20  $\mu$  is theoretically prestretchable 60 to 360% depending on the gear increment selected (1 - 7). In practical tests performed, the achievable degree of prestretching was somewhat less, however. A prestretching of more than 250% is, however, achievable without film breakage. If, however, the film for some reason, e.g. uneven quality, does break, the one-way clutch 20 will immediately disengage the input roller 4 from the transmission unit 16 and thus, from the driven roller 6. Disengagement also occurs instantaneously at extremely low film tension between the prestretching device and the pallet goods. The output roller can thus continue to rotate a short period of time with the film sliding over the periphery of the roller since the friction will be reduced when the tension in the film is absent, without the film, as in conventional arrangements, becoming tangled between the rollers. In an undriven prestretching device 2 it is possible, as is evident from Figure 4, with the gear increments 1-4, to increase the degree of prestretching from 60 to approximately 210% while retaining operational reliability.

With the prestretching device according to the invention, it is thus possible to use simply and effectively, and at low cost, plastic film with various properties in an optimal manner, thus substantially reducing the cost of the plastic film used.

Of particular advantage is the fact that a bicycle hub of reliable design, available on the market, after a small amount of adaptation, can be used as the transmission unit. An integrated unit is thereby provided coaxially mounted in one end of the output roller, which unit has three functions, viz. as a gear shift mechanism with seven gear speeds, a free-wheel clutch for automatic release of the input roller from the output roller in the event of film breakage, and a device for imparting torque to the output roller.

Finally, it is pointed out that the present invention is not to be considered limited to the embodiment described above by way of example. Rather, the invention comprises all those embodiments and equivalent solutions falling within the scope of the following patent claims.

## Claims

1. Stretch-film wrapping machine with an incrementally variable transmission (16) for transmitting torque between input and output rollers (4,6) in a prestretching device (2) of the stretch-film wrapping machine, to achieve selectable prestretching of a plastic film running in contact with said rollers and having a predetermined yield point, the input roller (4) being caused to rotate at a lower rotational speed than the output roller (6), said transmission (16) comprising a multiratio gear train (22) between an input shaft (28) and an output shaft (26), said gear train (22) being arranged in a housing (18), and a device (20) for engaging and disengaging the input shaft (28) to and from said gear train (22), **characterized** in that the input shaft (28) and the output shaft (26) of the gear train (22) are coaxial, that the engaging and disengaging device is a free-wheel clutch (20) which assumes its engagement position when the input roller (4), by means of the tension in the film between the rollers, is imparted a torque from the output roller (6), and that the clutch (20) assumes a free-wheel position when said torque is absent.
2. Machine according to Claim 1, **characterized** in that the housing (18) has two cylindrical, mutually concentric and interengaging components: an outer main component (26) constituting the output shaft of the gear train, and an inner housing component (28) forming the input shaft of the gear train, between said components (26,28) the free-wheel clutch (20) and the majority of the active components of the gear train (22) being enclosed.
3. Machine according to Claim 1 or 2, **characterized** in that the gear train (22) has a center through-shaft (30) which is concentrically arranged relative to the housing (18), the shaft ends (32,34) of which projecting outside individual end pieces of the housing, and that the shaft end (32) projecting from the inner housing component (28) is non-rotatably anchored in a mounting plate (44) of the prestretching device.
4. Machine according to Claim 3, **characterized** in that the shaft end (34) projecting from the opposite endpiece of the main component (26) is non-rotatably anchored in one end of a rod shaft (46) of relatively small diameter, that the rod shaft extends through the center of the output roller (6) rotatably mounted on the same, and that the other end of the rod shaft (46) is non-rotatably anchored (8,50) in the bottom portion of the prestretching device.
5. Machine according to Claims 1 - 4, **characterized** in that the gear train (22) has at least four gear speed increments.

6. Machine according to Claims 1 - 4, **characterized** in that the gear train (22) has seven different gear speed increments.
7. Machine according to one of Claims 2 - 6, **characterized** in that the main component (26) of the housing has adjacent its distal end (38) an annular flange (52), to which one end of the output roller (6) is securely fixed.
8. Machine according to one of the preceding claims, **characterized** in that the output roller (6) is joined to a drive device (58) which imparts a positive torque to the roller as a function of a predetermined value of the rotational direction of the roller and rotational speed for a given running speed of the plastic film as it leaves the prestretching device.
9. Machine according to Claim 8, **characterized** in that the drive device (58) comprises a pulley (24) fixed to the periphery of the main component (26) of the housing, said pulley being connectable via a drive belt to a corresponding pulley on a drive motor mounted in the prestretching device (2).
10. Machine according to Claim 9, **characterized** in that the gear train (22), the free-wheel clutch (20) and the pulley (24) are built together into a transmission unit (16).
11. Machine according to one of the preceding claims, **characterized** in that the gear train (22) consists of at least one planetary gear train.
12. Machine according to one of the preceding claims, **characterized** in that the transmission unit (18) is equipped with a bicycle hub of a type known per se.

#### Patentansprüche

1. Wickelmaschine für eine reckbare Folie mit einer inkremental verstellbaren Übertragung (16) zum Übertragen eines Drehmoments zwischen Eingangs- und Ausgangsrollen (4,6) in einer Vorreckvorrichtung (2) der Wickelmaschine einer reckbaren Folie, um eine auswählbares Vorrecken einer Plastikfolie zu erreichen, die in Kontakt mit den Rollen läuft, und die einen vorbestimmten Elastizitätspunkt hat, wobei die Eingangsrolle (4) gezwungen wird, sich mit einer geringeren Drehgeschwindigkeit als die Ausgangsrolle (6) zu drehen, die Übertragung (16) einen Getriebezug (22) mit Vielfachverhältnissen zwischen einem Eingangsschaft (28) und einen Ausgangsschaft (26) aufweist, wobei der Getriebezug in einem Gehäuse (18) angeordnet ist, und einer Vorrichtung (20) zum Einkuppeln und Auskuppeln des Eingangsschafts (28) von dem Getriebezug (22), dadurch **gekennzeichnet**, daß
- der Eingangsschaft (28) und der Ausgangsschaft (26) des Getriebezuges (22) koaxial angeordnet sind, daß die Einkuppel- und Auskuppelvorrichtung eine Kupplung (20) mit einem Freilauf ist, die ihre Einkuppelposition einnimmt, wenn auf die Eingangsrolle (4) ein Drehmoment von der Ausgangsrolle (6) mittels der Spannung des Films zwischen den Rollen ausgeübt wird, und daß die Kupplung (20) eine Freilaufposition einnimmt, wenn kein Drehmoment vorhanden ist.
2. Maschine nach Anspruch 1, dadurch **gekennzeichnet**, daß das Gehäuse (18) zwei zylindrische, zueinander konzentrische und miteinander in Eingriff stehende Komponenten aufweist; eine äußere Hauptkomponente (26), die den Ausgangsschaft des Getriebezuges bildet, und eine innere Gehäusekomponente (28), die den Eingangsschaft des Getriebezuges bildet, wobei zwischen den Komponenten (26, 28) die Freilaufkupplung (20) und die Mehrzahl der aktiven Komponenten des Getriebezuges (22) angeordnet sind.
3. Maschine nach Anspruch 1 oder 2, dadurch **gekennzeichnet**, daß der Getriebezug (22) einen zentralen Durchgangsschaft (30) aufweist, der konzentrisch relativ zu dem Gehäuse (18) angeordnet ist, dessen Schaftenden (32, 34) über die individuellen Endstücke des Gehäuses herausragen, und das über die innere Gehäusekomponente (28) herausragende Schaftende (32) undrehbar in einer Befestigungsplatte (44) der Vorreckvorrichtung verankert ist.
4. Maschine nach Anspruch 3, dadurch **gekennzeichnet**, daß das von dem entgegengesetzten Endstück der Hauptkomponente (26) hervorragende Schaftende (34) nicht drehbar in einem Ende eines Stabschaftes (46) mit relativ kleinem Durchmesser verankert ist, daß der Stabschaft sich durch das Zentrum der Ausgangsrolle (6) erstreckt, die drehbar an demselben befestigt ist, und daß das andere Ende des Stabschaftes (46) nicht drehbar in dem Bodenabschnitt der Vorreckvorrichtung verankert (8,50) ist.
5. Maschine nach Ansprüchen 1 bis 4, dadurch **gekennzeichnet**, daß der Getriebezug (22) mindestens vier Getriebebeschwindigkeitsstufen hat.
6. Maschine nach Ansprüchen 1 bis 4, dadurch **gekennzeichnet**, daß der Getriebezug (22) sieben verschiedene Getriebebeschwindigkeitsstufen hat.
7. Maschine nach einem der Ansprüche 2 bis 6, dadurch **gekennzeichnet**, daß die Hauptkomponente (26) des Gehäuses benachbart zu ihrem distalen Ende (38) einen ringförmigen Flansch (52)

aufweist, an dem ein Ende der Ausgangsrolle (6) zuverlässig befestigt ist.

8. Maschine nach einem der vorangegangenen Ansprüche, dadurch **gekennzeichnet**, dass an die Ausgangsrolle (6) mit einer Antriebsvorrichtung (58) verbunden ist, die ein positives Drehmoment auf die Rolle als eine Funktion eines vorbestimmten Werts der Drehrichtung der Rolle und der Drehgeschwindigkeit für eine gegebene Laufgeschwindigkeit der Plastikfolie ausübt, mit der sie die Vorreckvorrichtung verlässt. 5
9. Maschine nach Anspruch 8, dadurch **gekennzeichnet**, dass die Antriebsvorrichtung (58) eine an der Peripherie der Hauptkomponente (26) des Gehäuses befestigte Riemenscheibe (24) aufweist, wobei die Riemenscheibe über einen Antriebsriemen mit einer entsprechenden Riemenscheibe eines Antriebsmotors verbindbar ist, der in der Vorreckvorrichtung (2) befestigt ist. 10 15 20
10. Maschine nach Anspruch 9, dadurch **gekennzeichnet**, dass der Getriebezug (22), die Freilaufkupplung (20) und die Riemenscheibe (24) zusammen in einer Übertragungseinheit (16) eingebaut sind. 25
11. Maschine nach einem der vorangegangenen Ansprüche, dadurch **gekennzeichnet**, dass der Getriebezug (22) aus mindestens einem Planetengetriebezug besteht. 30
12. Maschine nach einem der vorangegangenen Ansprüche, dadurch **gekennzeichnet**, dass die Übertragungseinheit (18) mit einer Fahrradnabe eines bekannten Typs versehen ist. 35

## Revendications

1. Machine d'emballage à film étirable avec une transmission (16) variable par incréments pour transmettre un couple entre des rouleaux d'entrée et de sortie (4, 6) dans un dispositif (2) de préétirage de la machine d'emballage à film étirable, pour obtenir un préétirage, pouvant être choisi, d'un film plastique défilant en contact avec lesdits rouleaux et ayant une limite d'allongement prédéterminée, le rouleau de sortie (4) étant amené à tourner à une vitesse de rotation plus petite que celle du rouleau de sortie (6), ladite transmission (16) comprenant un train d'engrenages (22) à plusieurs rapports entre un arbre d'entrée (28) et un arbre de sortie (26), ledit train d'engrenages (22) étant disposé dans un boîtier (18), et un dispositif (20) pour embrayer l'arbre d'entrée (28) audit train d'engrenages (22) et pour l'en débrayer, caractérisée en ce que l'arbre d'entrée (28) et l'arbre de sortie (26) du train d'engrenages (22) sont coaxiaux, en ce que le dispositif d'embrayage et de débrayage est un embrayage (20) à roue libre qui prend sa position embrayée lorsque le rouleau d'entrée (4), au moyen de la tension dans le film entre les rouleaux, subit un couple provenant du rouleau de sortie (6), et en ce que l'embrayage (20) prend sa position de roue libre lorsque ledit couple est absent. 40 45 50 55
2. Machine selon la revendication 1, caractérisée en ce que le carter (18) possède deux composants cylindriques, mutuellement concentriques et coopérant mutuellement : un composant (26) principal extérieur constituant l'arbre de sortie du train d'engrenages, et un composant (28) de carter intérieur formant l'arbre d'entrée du train d'engrenages, l'embrayage (20) à roue libre et la majorité des composants actifs du train d'engrenages (22) étant enfermés entre lesdits composants (26, 28).
3. Machine selon la revendication 1 ou 2, caractérisée en ce que le train d'engrenages (22) comporte un arbre traversant central (30) qui est disposé de façon concentrique par rapport au carter (18), dont les extrémités d'arbre (32, 34) dépassent à l'extérieur de pièces d'extrémités individuelles du carter, et en ce que l'extrémité d'arbre (32) dépassant du composant (28) de carter intérieur est ancrée de façon non mobile en rotation dans une plaque de montage (44) du dispositif de préétirage.
4. Machine selon la revendication 3, caractérisée en ce que l'extrémité d'arbre (34) dépassant de la pièce d'extrémité opposée du composant principal (26) est ancrée de façon non mobile en rotation dans une extrémité d'une tige (46) de diamètre relativement petit, en ce que la tige passe par le centre du rouleau de sortie (6) monté mobile en rotation sur celle-ci et en ce que l'autre extrémité de la tige (46) est ancrée de façon non mobile en rotation (8, 50) dans la partie inférieure du dispositif de préétirage.
5. Machine selon les revendications 1 à 4, caractérisée en ce que le train d'engrenages (22) comprend au moins quatre incréments de vitesse.
6. Machine selon les revendications 1 à 4, caractérisée en ce que le train d'engrenages (22) comprend au moins sept incréments de vitesse.
7. Machine selon l'une quelconque des revendications 2 à 6, caractérisée en ce que le composant principal (26) du carter comporte, adjacente à son extrémité distale (38) une collerette annulaire (52), à laquelle est fixée solidement une extrémité du rouleau de sortie (6).
8. Machine selon l'une quelconque des revendications précédentes, caractérisée en ce que le rou-

leau de sortie (6) est relié à un dispositif (58) d'entraînement qui applique un couple positif au rouleau en fonction d'une valeur prédéterminée du sens de rotation du rouleau et de la vitesse de rotation, pour une vitesse de défilement donnée du film plastique lorsqu'il quitte le dispositif de préétirage. 5

9. Machine selon la revendication 8, caractérisée en ce que le dispositif (58) d'entraînement comprend une poulie (24) fixée à la périphérie du composant principal (26) du carter, ladite poulie pouvant être reliée, par l'intermédiaire d'une courroie d'entraînement, à une poulie correspondante d'un moteur d'entraînement monté dans le dispositif (2) de pré- 10  
tirage. 15

10. Machine selon la revendication 9, caractérisée en ce que le train d'engrenages (22), l'embrayage (20) à roue libre et la poulie (24) sont incorporés ensemble dans un module (16) de transmission. 20

11. Machine selon l'une quelconque des revendications précédentes, caractérisée en ce que le train d'engrenages (22) est constitué d'au moins un train d'engrenages planétaires. 25

12. Machine selon l'une quelconque des revendications précédentes, caractérisée en ce que le module (16) de transmission est équipé d'un moyeu de bicyclette d'un type connu en soi. 30

35

40

45

50

55

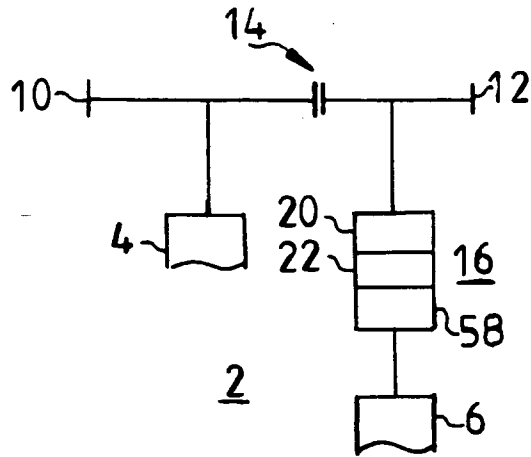


Fig.1

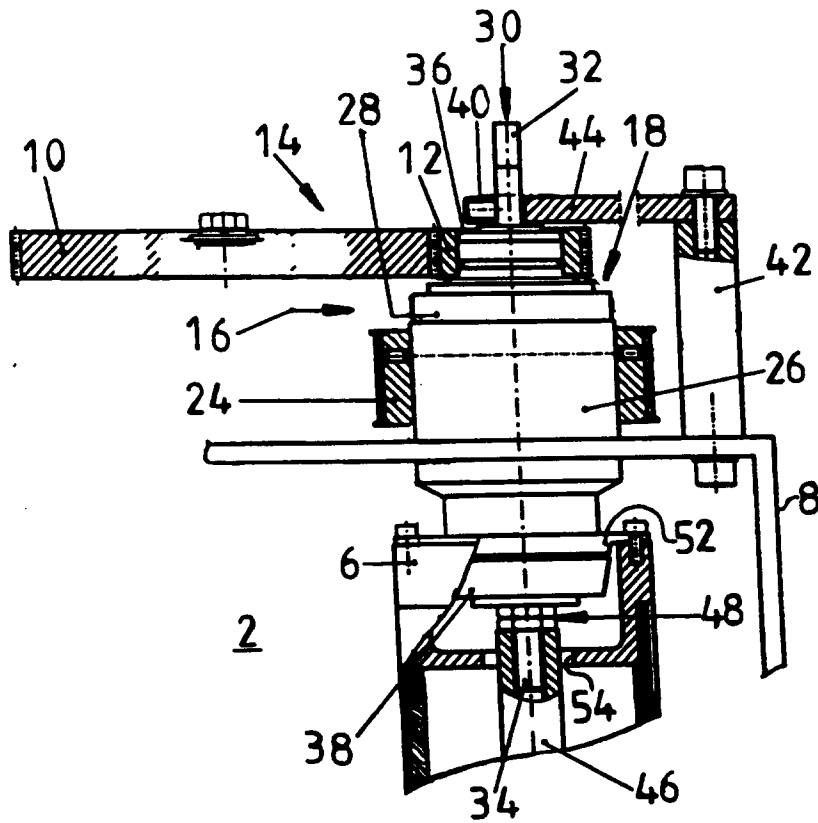


Fig.2

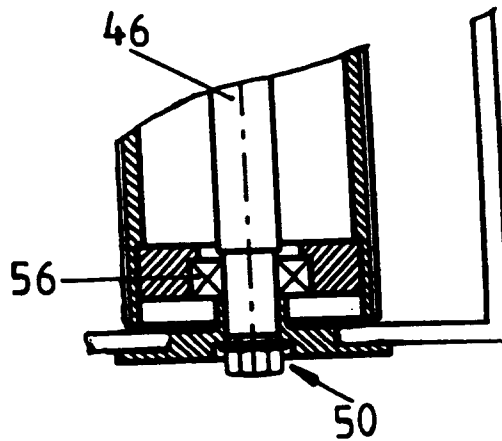


Fig.3

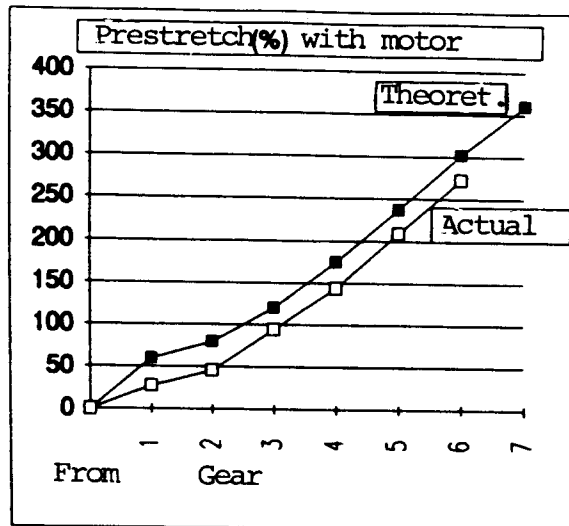


Fig.4

