A packing machine for packing bales of straw fodder

Verpackungsmaschine zum Verpacken von Strohballen

Machine d'emballage pour emballer des balles de paille

Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE

Priority: 22.11.1991 NO 914583
Date of publication of application: 26.05.1993 Bulletin 1993/21
Proprietor: TELLEFSDAL A/S
N-4992 Fløne (NO)

Inventor: Skole, Knud
N-4950 Risør (NO)

Representative: Perklev, Karin Cecilia et al
AWAPATENT AB,
P.O. Box 5117
200 71 Malmö (SE)

References cited:
DE-U- 9 004 354

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).
Description

The present invention relates to a packing machine, optionally an attachment for a packing machine, for packing bales of straw fodder of a "rectangular" form, wherein plastic sheathing is deposited in layers or overlapping around the straw fodder bale, said machine comprising two drive rollers which rotate said straw fodder bale around a substantially horizontal axis.

In agriculture, it is becoming more and more common to ensile straw fodder in the form of packed straw fodder bales. There is a movement away from the traditional silo plant. This method of ensilage, which has gradually become well known, has taken place in that the fodder, such as grass or straw, has been packed in round bales. Thereafter sheeting, preferably plastic sheeting, is wrapped around the bales, thus they can be stored outdoors without any problems, and the ensilage can take place inside a thus virtually hermetically packed bale. This has reduced the work connected with fodder considerably, and has also given rise to advantageous gains for the environment, as the leakage of silage fluids has virtually ceased and the use of chemicals has been greatly reduced.

The applicant's Norwegian Patent 159366 makes known a packing machine (see figure 5) which packs straw fodder bales, often round bales, which, broadly speaking, have in fact the form of a short cylinder. The round bale lies on two substantially parallel running rollers which are spaced apart from one another at a distance which is less than the diameter of the round bale. The rollers are operated rotationally and cause the bale to rotate around a substantially horizontal axis. The packing machine also has a superjacent crank mechanism which carries a vertically positioned roll of stretchable, adhesive plastic sheathing. The plastic sheeting is moved in a horizontal path around the fodder bale at the height of the centre line of said fodder bale. When the drive rollers rotate the round bale around their horizontal axis at the same time as the crank mechanism moves the sheeting in said horizontal path, the plastic sheeting is wrapped in layers or overlapping around the round bale, and packs it almost hermetically.

A packing machine of this kind can be stationary, per se, but in a practical embodiment which is already on the market, the packing machine is designed for rapid connection to a tractor, either mounted at the front or at the back. The power outlet of the tractor may be used for the whole of, or parts of, the operation.

Norwegian Patent 1655356 makes known another kind of round bale packer which is mounted on an undercarriage on wheels. Here too, the round bale is supported by two parallel running and spaced apart rollers which cause the round bale to rotate around a substantially horizontal axis. The rollers are positioned on a swivel table which can rotate in relation to the undercarriage in such a way that the round bale can also rotate around a substantially vertical axis. Fixed in a stationary manner to the undercarriage is a roll of plastic sheeting which, after being attached to the bale, is wrapped around said bale in layers or overlapping when the round bale is rotated around its two axes. Furthermore, the rollers can be tipped in relation to the undercarriage so that the round bale rolls off therefrom.

A similar round bale packer is also known from GB Application 2191984 and EP Application No. 0208034.

It has been established that in some countries equipment already exists which packs the straw fodder bales in an almost "rectangular" form. What is described by this term is a form which is almost parallelepiped and cube-shaped. The known packing machines referred to above are not capable of handling straw fodder bales of a rectangular form, only those of the conventional cylindrical form. There has been a need to be able to pack these rectangular straw fodder bales in a similar manner as the cylindrical bales.

An objective of the present invention has been to provide either a new complete packing machine, or optionally an attachment which can be mounted subsequently on machines which already exist, for packing bales of straw fodder which are rectangular in form. It is important to understand that the attachment can be mounted subsequently for packing rectangular bales on both of the main kinds of packing machines which have been referred to hereinabove.

According to the invention, this is achieved by a packing machine, or optionally an attachment thereto, according to claims 1 and 5, respectively.

As mentioned, the machine may be of the kind with a swivel arm or a crank mechanism, wherein the swivel arm feeds the plastic sheeting and draws it around the straw bale as said swivel arm moves in a horizontal path of motion.

Alternatively, the machine can be of the kind which has a swivel table (figure 6) which in addition to rotating the bale around a substantially horizontal axis, also rotates the bale around a substantially vertical axis.

It would be advantageous for the surfaces of the auxiliary rollers to be provided with grooves or grab teeth so that slipping against the bale is avoided.

The roller units are advantageously movable towards and away from one another in a substantially horizontal direction, so that the machine can be adapted to different bale sizes, as well as have the ability of picking up a bale which is lying on the ground.

The auxiliary rollers can expediently be driven by the drive roller by means of chain drive.

The invention will now be described in more detail by means of an embodiment example where the machine is of the kind which is equipped with a swivel arm. The embodiment example is described with reference to the enclosed drawings where:

Figure 1 shows a packing machine according to the invention in perspective,
figure 2 shows a schematic frontal outline of the packing machine according to figure 1,
figure 3 shows schematically a rotation sequence of the rectangular bale around the horizontal axis,

figure 4 shows a longitudinal section through the drive roller and the auxiliary roller, and an end section of the roller unit,

figure 5 depicts the previously known packing machine of the kind which has a swivel arm, and

figure 6 depicts the previously known packing machine of the kind which has a swivel table.

Reference is made to figure 1 which shows a packing machine 10 of the type having a swivel arm 3, also called a crank mechanism. A bale of straw fodder 5 of a "rectangular" form is indicated on the drawing with broken lines. The straw fodder bale 5 rests upon spaced apart roller units 4. The distance between the roller units 4 is adapted to the longitudinal or lateral extent of the straw bale 5. Each roller unit 4 comprises a drive roller 1 and two auxiliary rollers 2. The auxiliary rollers 2 are driven to rotate by the drive roller 1. This can be effected by means of, for example, chain drive, belt drive, direct cogwheel transmission or friction roller transmission. In the embodiment depicted, each auxiliary roller 2 has grooves 8, but these may, of course, be replaced by grab teeth, or optionally a suitable friction coating. This shall prevent the auxiliary rollers from slipping against the straw fodder bale 5. It is intended that the drive roller itself should not touch the straw fodder bale 5.

The packing machine also comprises a roll of plastic sheeting which is mounted on the swivel arm 3 in such a way that it can be brought into a horizontal path at the height of the fodder bale and be drawn around said bale at the same time as said fodder bale 5 rotates. The plastic sheeting is, however, not shown on figures 1-5, and in that respect reference is made to figure 6 and to Norwegian Patent 159366, referred to previously.

On the back edge of the roller units 4, two support rollers 7 are mounted, to which the fodder bale 5 rests adjacent at the back edge.

Figure 2 illustrates schematically the packing machine 10 viewed from the front where the straw fodder bale 5 has started its rotational movement. As can be seen from the figure, the fodder bale 5 rests, in this phase, on all the auxiliary rollers 2. The roller units 4 are, as shown, also rotatable around the axis of the drive roller 1. This rotational movement goes beyond or is restricted to turning through a certain predetermined angle. The roller units 4 are also biased in the sense that said rotational movement around the axis of the drive roller takes place against a certain pretension, so that the roller unit 4, without the load of a fodder bale 5, will be forced around said axis in an anti-clockwise direction in the right-hand roller unit and in a clockwise direction in the left-hand roller unit in figure 2. The roller units 4 can also be driven towards and away from one another horizontally in order to be able to handle bales of different sizes.

Figure 3 shows a rotational sequence through the first 90° of the turning movement of the rectangular bale. This also shows how the roller units 4 work the whole time during the turning of the rectangular bale. The figure is schematic and it shall be understood that the auxiliary rollers 2 at times are pressed more or less into the rectangular bale, or possibly have no contact at all. As can be seen, the direction of rotation for all four auxiliary rollers 2 is the same. This rotation of the rollers 2 and the independent biased pivotal movement of each separate roller unit 4 causes the turning of the rectangular bale without it being dispatched from the roller units. A prototype has been constructed, and trials show that this functions extremely well in practice.

Figure 4 shows a longitudinal section through the drive roller 1 and the auxiliary roller 2. At the end of each roller, a chain wheel 11 is mounted for the transmission of power to the auxiliary rollers 2. A cover may in turn be placed over the power transmission or the illustrated chain transmission. In one embodiment the drive roller 1 is stationary, i.e., the outer surface thereof remains stationary, whilst the operation takes place inside the roller from a hydraulic engine 9, via an intermediate shaft 12 to the chain wheel 11. The output shaft journal 13 of the hydraulic engine 9 is advantageously mounted 15 inside the roller 1, e.g., in the central part thereof.

Figure 5 shows, as mentioned, a previously known packing machine of the kind having a swivel arm. Correspondingly, figure 6 depicts a packing machine of the kind having a swivel table. These are shown to illustrate that the roller units 4 can replace the previous drive rollers on existing packing machines, and thus be a subsequently mountable attachment for these earlier packing machines. Thus previously known packing machines can be converted to machines which can handle rectangular bales of straw fodder.

Claims

1. A packing machine for packing a bale of straw fodder (5) of a parallelepipedic form, wherein plastic sheeting is deposited in layers or overlapping around said straw fodder bale (5), said packing machine comprising means for rotating the bale around a substantially horizontal axis, characterized in that said means for rotating the bale comprise two roller units (4), each of which comprises at least two rollers (2), which are disposed in a predetermined spaced parallel relationship to each other and which are able to engage said fodder bale, and drive means (1; 9, 12) for rotating the rollers, each roller unit being pivotably biased about and mounted on the axis of the drive means, two such spaced apart roller units (4) when in operation being able to turn a parallelepipedic bale through 360° around said substantially horizontal axis.
2. A packing machine according to claim 1, wherein the machine has a swivel arm (3), which swivel arm feeds the sheeting and stretches it around the fodder bale (5), said swivel arm moving on a substantially horizontal path of motion.

3. A packing machine according to claim 1, wherein the machine has a swivel table, which, in addition to rotating the bale around a substantially horizontal axis, also rotates the bale around a substantially vertical axis.

4. A packing machine according to any one of claims 1-3, wherein the roller units (4) are moveable towards and away from one another in a substantially horizontal direction.

5. An attachment for a packing machine for packing a bale of straw fodder (5) of a parallelepipedic form, wherein plastic sheeting is deposited in layers or overlapping around said straw fodder bale (5), characterized by two roller units (4), each of which comprises at least two rollers (2), which are disposed in a predetermined spaced parallel relationship to each other and which are able to engage said fodder bale, and drive means (1) for rotating the rollers, each roller unit being pivotally biased about and mounted on the axis of the drives means, two such spaced apart roller units (4) in operation being able to turn a parallelepipedic bale through 360° around a substantially horizontal axis.

6. A packing machine according to claims 1, 2, 3 or an attachment according to claim 5, wherein there are grooves (8) or grab teeth on the surfaces of the rollers (2).

7. A packing machine according to any one of claims 1-4, 6 or an attachment according to any one of claims 5, 6, wherein the rollers (2) are driven by means of chain drive, belt drive, cogwheel transmission or friction transmission.

8. A packing machine according to any one of claims 1-4, 6, 7 or an attachment according to any one of claims 5-7, wherein the drive means includes a drive roller.

9. An attachment according to any one of claims 5-8, wherein the rollers (2) are in a certain spaced relationship in a frame, said rollers being operable at the same rate of rotation by means of drive transmissions.

Patentansprüche

1. Verpackungsmaschine zum Verpacken eines quadratischen Strohfutterballens (5), in der Kunststofffolie in Schichten oder überlappend um den Strohfutterballen (5) gelegt wird, umfassend Mittel zum Drehen des Ballens um eine im wesentlichen horizontale Achse, dadurch gekennzeichnet, daß die Mittel zum Drehen des Ballens zwei Rolleneinheiten (4) aufweisen, von denen jede mindestens zwei Rollen (2), die in einem vorgegebenen bestandeten, parallelen Verhältnis zueinander angeordnet und imstande sind, den Futterballen anzuziehen, und Antriebsmittel (1; 9, 12) zum Drehen der Rollen aufweist, wobei jede Rolleneinheit schwenkbar vorgespannt um die Achse der Antriebsmittel auf der Achse montiert ist, und wobei zwei dieser voneinander bestandeten Rolleneinheiten (4) im Betrieb imstande sind, einen quadratischen Ballen über 360° um die im wesentlichen horizontale Achse zu drehen.

2. Verpackungsmaschine nach Anspruch 1, wobei die Maschine einen Schwenkarm (3) aufweist, der die Folie zuführt, um den Futterballen (5) zu strecken und der sich auf einer im wesentlichen horizontalen Bewegungsbahn bewegt.

3. Verpackungsmaschine nach Anspruch 1, wobei die Maschine einen Schwenkarm aufweist, der den Ballen zusätzlich zur Drehung um eine im wesentlichen horizontale Achse auch um eine im wesentlichen vertikale Achse dreht.

4. Verpackungsmaschine nach einem der Ansprüche 1-3, in der die Rolleneinheiten (4) in im wesentlichen horizontaler Richtung aufeinander zu und voneinander weg bewegbar sind.

5. Zusatzeinrichtung für eine Verpackungsmaschine zum Verpacken eines quadratischen Strohfutterballens (5), in der Kunststofffolie in Schichten oder überlappend um den Strohfutterballen (5) gelegt wird, gekennzeichnet durch zwei Rolleneinheiten (4), von denen jede mindestens zwei Rollen (2), die in einem vorgegebenen bestandeten, parallelen Verhältnis zueinander angeordnet und imstande sind, den Futterballen anzuziehen, und Antriebsmittel (1) zum Drehen der Rollen aufweist, wobei jede Rolleneinheit schwenkbar vorgespannt um die Achse der Antriebsmittel auf der Achse montiert ist, und wobei zwei dieser voneinander bestandeten Rolleneinheiten (4) im Betrieb imstande sind, einen quadratischen Ballen über 360° um die im wesentlichen horizontale Achse zu drehen.

6. Verpackungsmaschine nach einem der Ansprüche 1, 2, 3 oder Zusatzeinrichtung nach Anspruch 5, wobei auf den Oberflächen der Rollen (2) Rillen (8) oder Greifzähne vorhanden sind.

7. Verpackungsmaschine nach einem der Ansprüche 1-4 oder 6 oder Zusatzeinrichtung nach einem der Ansprüche 5 oder 6, wobei die Rollen (2) mittels
eines Kettenantriebes, Riemenantriebes, Zahnradantriebes oder Reibantrieben angetrieben werden.

8. Verpackungsmaschine nach einem der Ansprüche 1-4, 6 oder 7 oder Zusatzeinrichtung nach einem der Ansprüche 5-7, wobei das Antriebsmittel eine Antriebsrolle enthält.

9. Zusatzeinrichtung nach einem der Ansprüche 5-8, wobei sich die Rollen (2) in einem bestimmten beabstandeten Verhältnis in einem Rahmen befinden und mittels Antriebsgetriebe mit der gleichen Drehgeschwindigkeit antreibbar sind.

Revendications

1. Machine à emballer, destinée à emballer des balles de fourrage de paille (5) de forme parallélépipédique, dans laquelle une feuille de matière plastique est déposée en couches ou avec recouvrement autour de la balle de fourrage de paille (5), ladite machine à emballer comprenant des moyens servant à faire tourner ladite balle de fourrage de paille autour d'un axe sensiblement horizontal, caractérisée en ce que lesdits moyens servant à faire tourner la balle comprennent deux unités de rouleaux (4), dont chacune comprend au moins deux rouleaux (2), qui sont disposées dans des positions parallèles entre elles, espacées et prédéterminées, et qui sont capables d'attaquer ladite balle de fourrage, et des moyens d'entraînement (1; 9, 12) servant à faire tourner les rouleaux, chaque unité de rouleaux étant rappelée élastiquement en mouvement de pivotement autour de l'axe des moyens d'entraînement et étant montée sur cet axe, deux unités de rouleaux (4) de ce type, espacées l'une de l'autre, étant capables de faire tourner une balle parallélépipédique de 360° autour dudit axe sensiblement horizontal lorsqu'elles sont en fonctionnement.

2. Machine à emballer selon la revendication 1, dans laquelle la machine possède un bras pivotant (3), lequel bras pivotant achemine la feuille et la tend autour de ladite balle de fourrage (5), ledit bras pivotant se déplaçant sur un trajet de mouvement sensiblement horizontal.

3. Machine à emballer selon la revendication 1, dans laquelle la machine possède une table tournante qui, en supplément du fait qu'elle fait tourner la balle autour d'un axe sensiblement horizontal, fait aussi tourner la balle autour d'un axe sensiblement vertical.

4. Machine à emballer selon une quelconque des revendications 1 à 3, dans laquelle les unités de rouleaux (4) peuvent se rapprocher et s'éloigner l'une de l'autre dans une direction sensiblement horizontale.

5. Accessoire pour une machine à emballer destinée à emballer une balle de fourrage de paille (5) de forme parallélépipédique, dans laquelle la feuille de matière plastique est déposée en couches ou avec recouvrement autour de ladite balle de fourrage de paille (5), caractérisé par deux unités de rouleaux (4), dont chacune comprend au moins deux rouleaux (2), qui sont disposées dans des positions parallèles entre elles, espacées et prédéterminées et qui sont capables d'attaquer ladite balle de fourrage, et des moyens d'entraînement (1) servant à faire tourner les rouleaux, chaque unité de rouleaux étant rappelée élastiquement en mouvement de pivotement autour de l'axe des moyens d'entraînement et étant montée sur cet axe, deux unités de rouleaux (4) de ce type, espacées l'une de l'autre, étant capables de faire tourner une balle parallélépipédique de 360° autour d'un axe sensiblement horizontal lorsqu'elles sont en fonctionnement.

6. Machine à emballer selon les revendications 1, 2, 3, ou accessoire selon la revendication 5, dans laquelle ou lequel il y a des rainures (8) ou des dents agrippantes sur les surfaces des rouleaux (2).

7. Machine à emballer selon une quelconque des revendications 1 à 4 ou 6, ou accessoire selon une quelconque des revendications 5, 6, dans laquelle ou lequel les rouleaux (2) sont entraînés au moyen d'une transmission à chaîne, d'une transmission à courroie, d'une transmission à roues dentées ou d'une transmission à friction.

8. Machine à emballer selon une quelconque des revendications 1 à 4 ou 6, ou accessoire selon une quelconque des revendications 5 à 7, dans laquelle ou lequel les moyens d'entraînement comprennent un rouleau d'entraînement.

9. Accessoire selon une quelconque des revendications 5 à 8, dans lequel les rouleaux (2) sont disposés à un certain écartement dans un châssis, lesdits rouleaux pouvant être mis en action à la même vitesse de rotation ou moyen de transmissions d'entraînement.