United States Patent

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[72] Inventors **Hans Reifenhäuser Troisdorf; Horst Gunter Keferstein, Mullekoven; Friedrich A. Reifenhäuser, Troisdorf; Heinz Herchenbach, Troisdorf, all of Germany**

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[73] Assignee **Reifenhauser K.G. Maschinenfabrik Troisdorf, Germany**

[54] **APPARATUS FOR WINDING CONTINUOUSLY PRODUCED LAYER MATERIAL ON ELONGATED CORE**
3 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** ..... **242/56 R,** 242/65, 242/68.4
[51] **Int. Cl.** **B65h 19/26**
[50] **Field of Search** 242/56, 56.2, 56.7, 56.9, 65, 66, 68.4

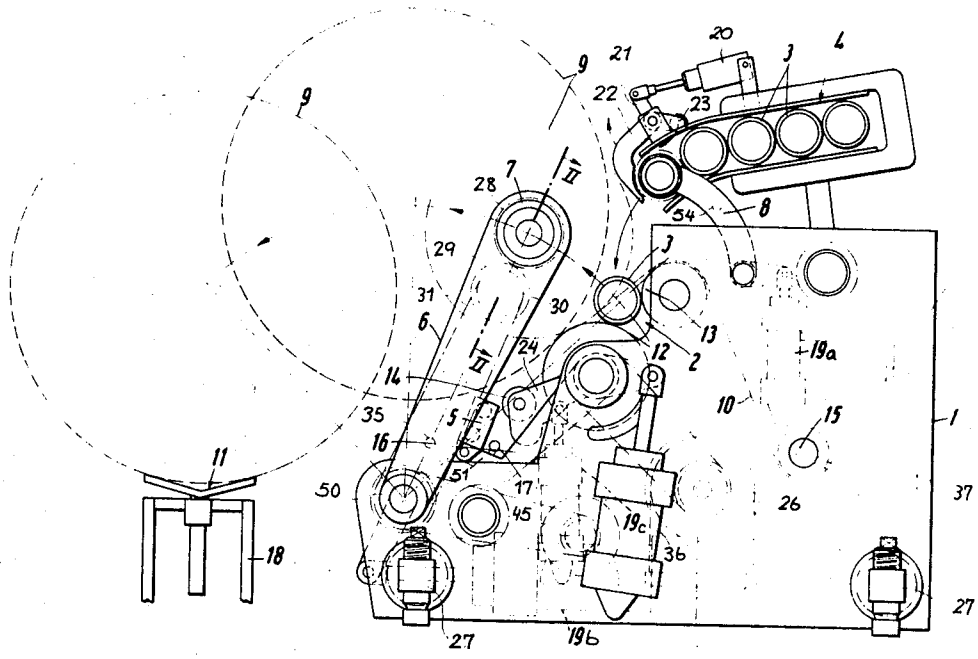
[56] **References Cited**

UNITED STATES PATENTS

2,520,826	8/1950	Beck	242/65
2,989,262	6/1961	Hornbostel	242/56
3,066,883	12/1962	Egan	242/66 X
3,075,719	1/1963	Hornstein et al.	242/65
3,137,456	6/1964	Weber et al.	242/56
3,291,412	12/1966	Rockstrom et al.	242/65
3,332,636	7/1967	Rockstrom et al.	242/65
3,429,520	2/1969	Egan	242/65
3,494,566	2/1970	Pawelczyk	242/56

Primary Examiner—Stanley N. Gilreath
Assistant Examiner—Werner H. Schroeder
Attorney—Karl F. Ross

ABSTRACT: An apparatus for winding continuously produced layer material (e.g. synthetic-resin film or foil) on an elongated core holds a plurality of cores in a magazine and grips them axially one at a time between two arms to place them on the material in a cradle formed by a plurality of rollers. Then two pivotal transport arms axially grip the winding core and, as it is wound, move through a dead center position to deposit the wound core in an unloading station. As the one core is being unloaded, another is being fed into the cradle for continuous winding.



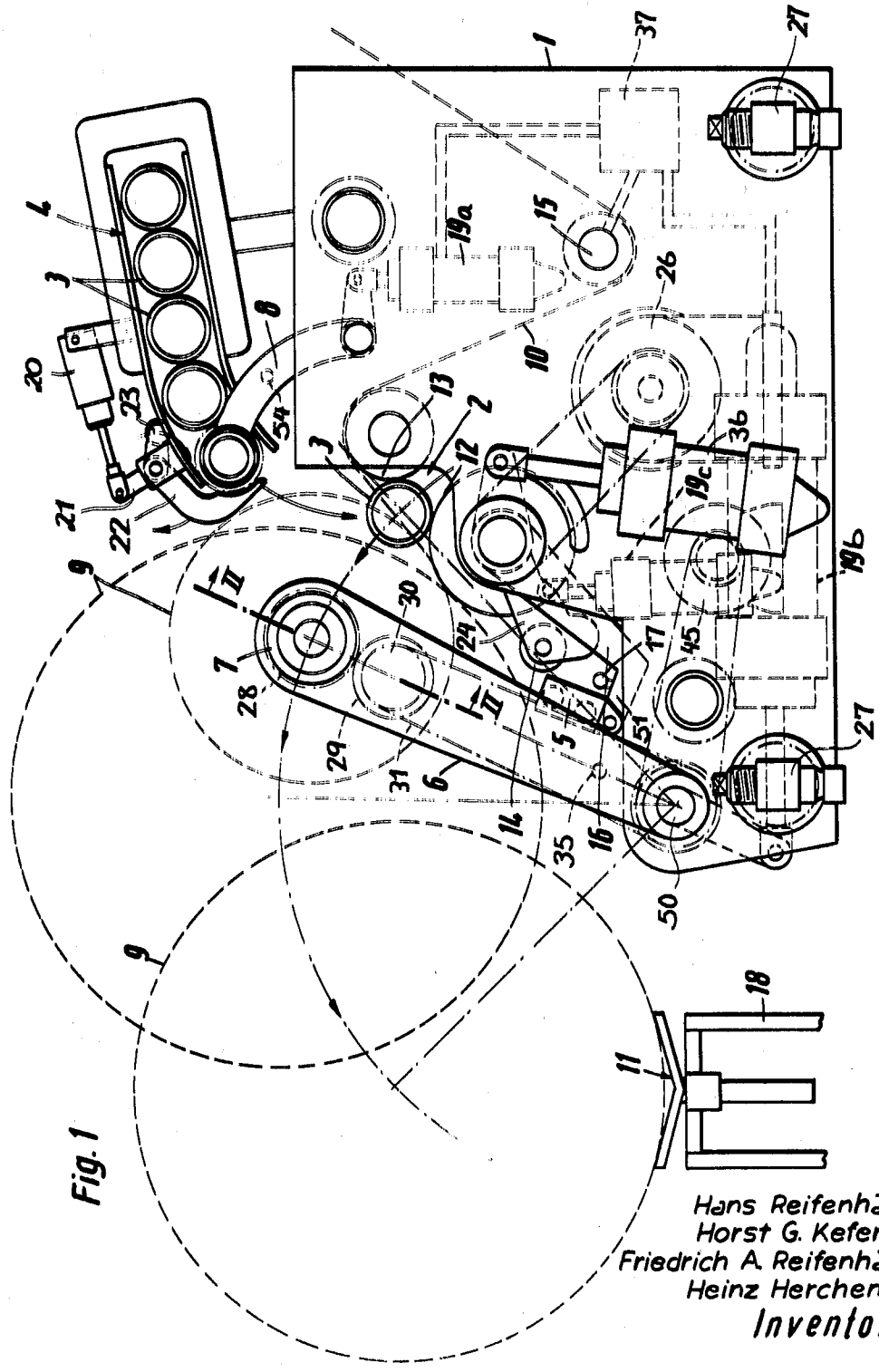


Fig. 1

Hans Reifenhäuser
Horst G. Keferstein
Friedrich A. Reifenhäuser
Heinz Herchenbach
Inventors.

By Karl G. Ross
Attorney

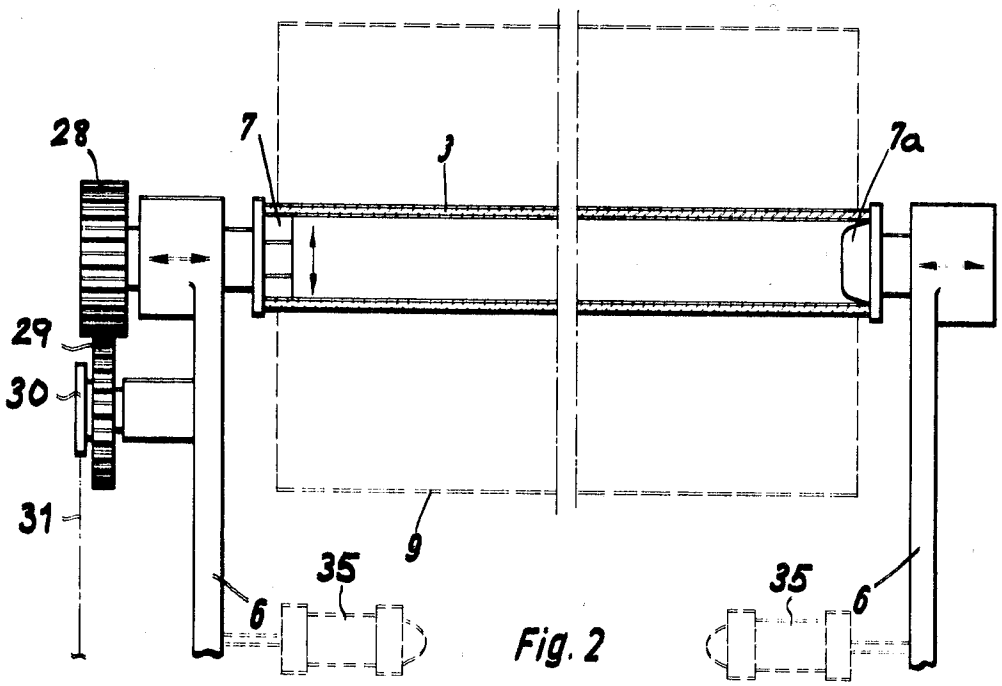


Fig. 2

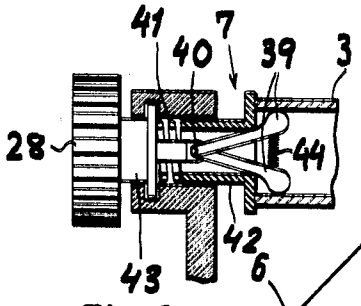


Fig. 2a

Fig. 3

Inventors:
Hans Reifenhäuser
Horst G. Keferstein
Friedrich A. Reifenhäuser
Heinz Herchenbach
Karl F. Ross Attorney

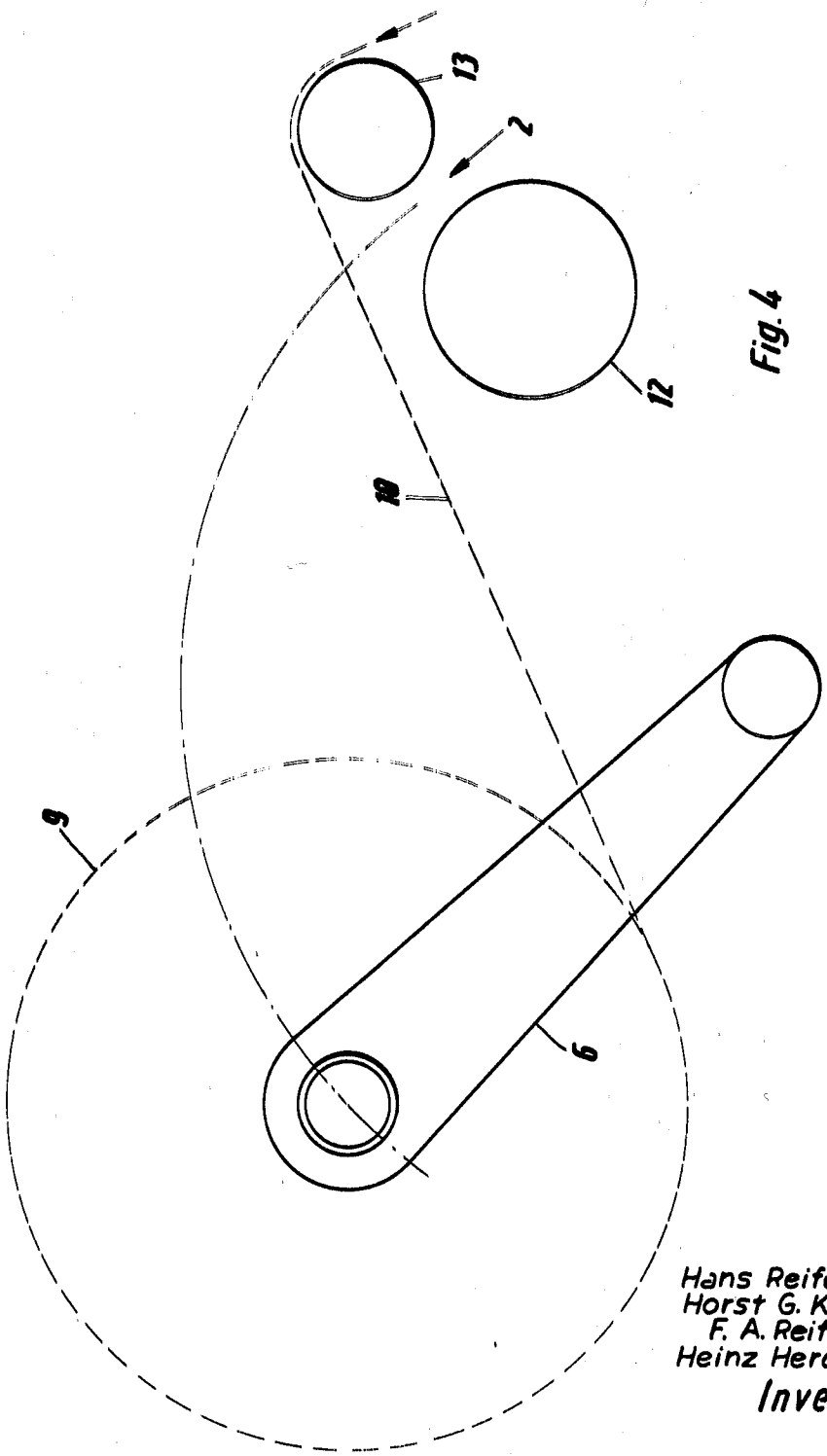


Fig. 4

Hans Reifenhäuser
Horst G. Keferstein
F. A. Reifenhäuser
Heinz Herchenbach
Inventors.

By Karl F. Ross
Attorney

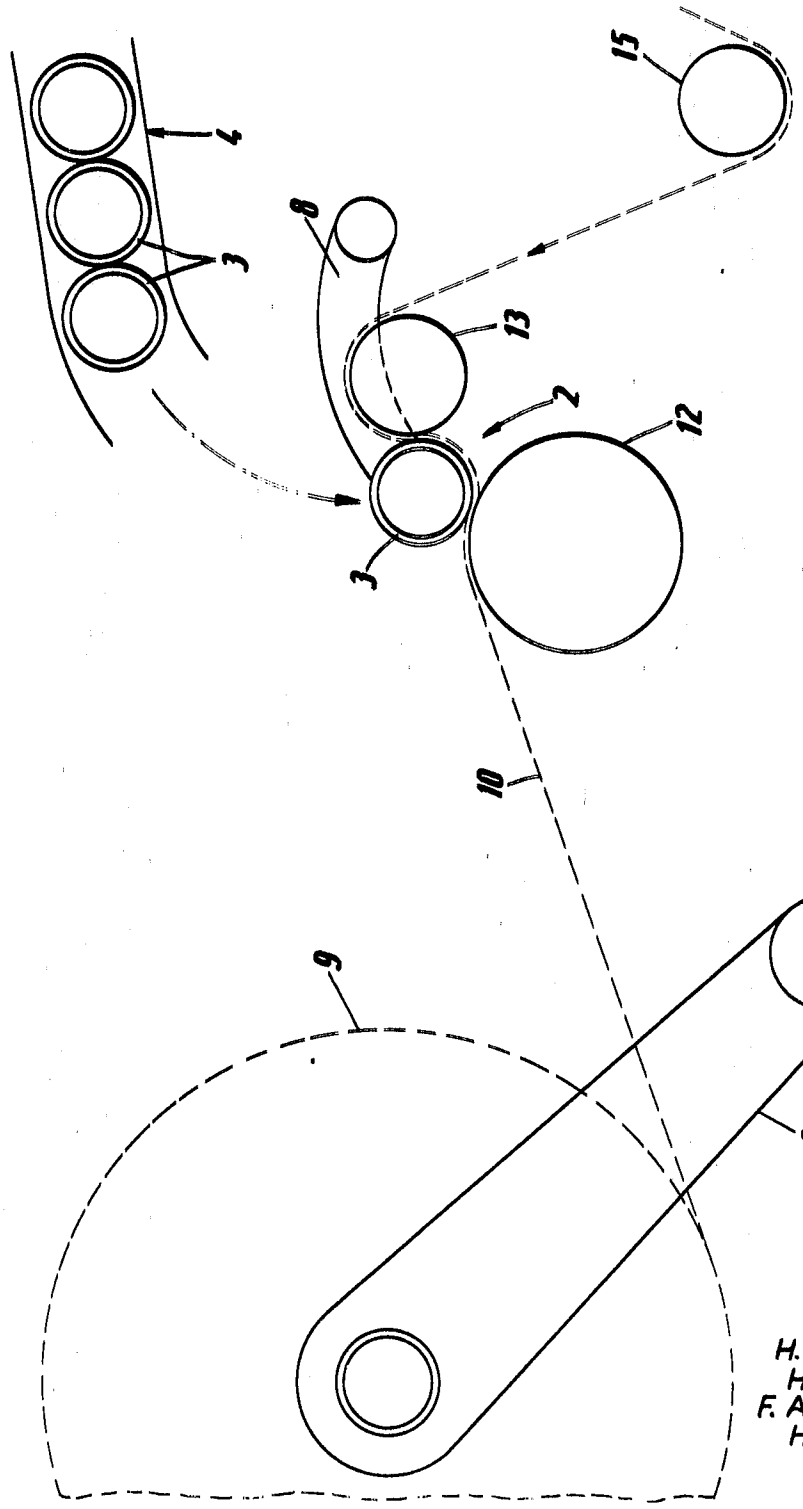


Fig.5

H. Reifenhäuser
H. G. Keferstein
F. A. Reifenhäuser
H. Herchenbach
Inventors.

By Karl F. Ross
Attorney

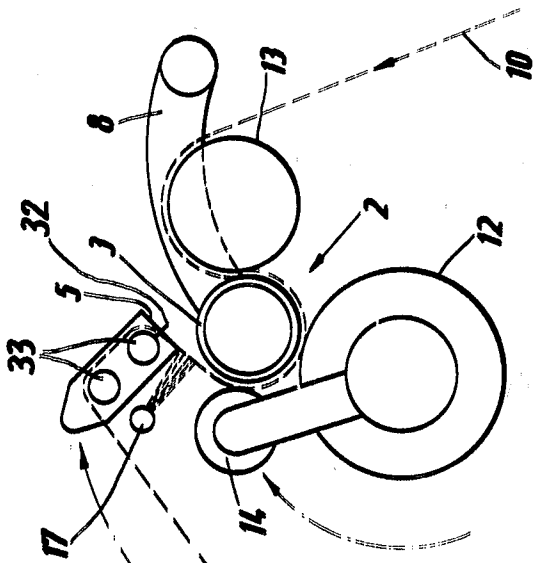


Fig. 6

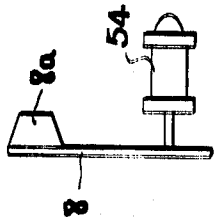
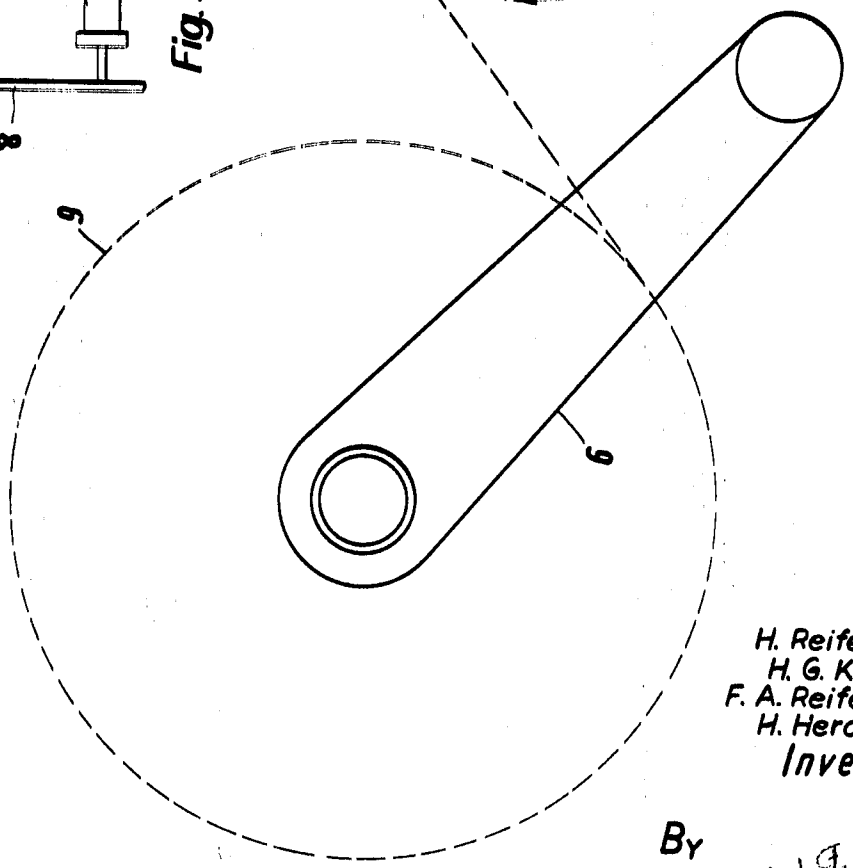
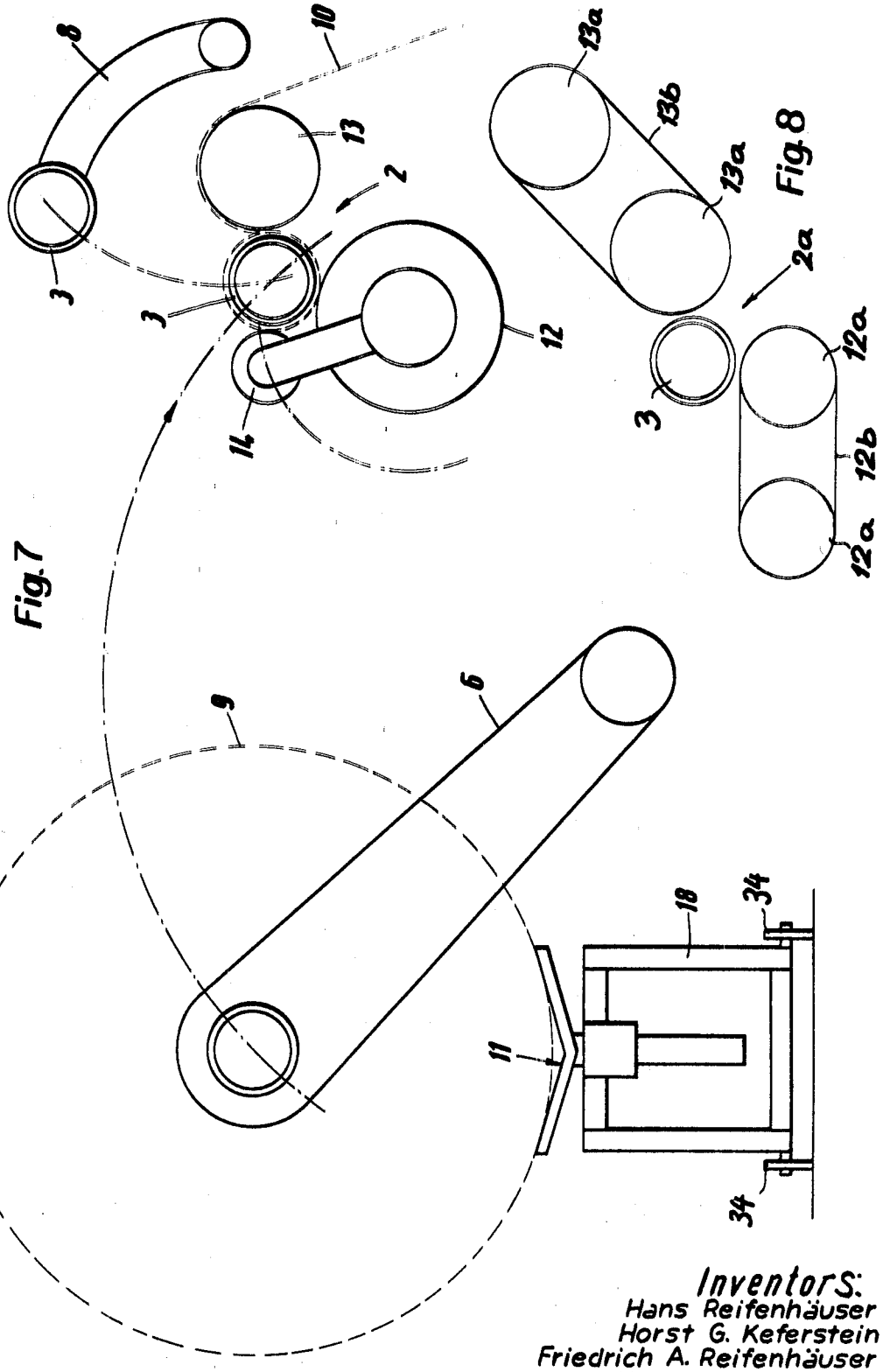


Fig. 9



H. Reifenhäuser
H. G. Keferstein
F. A. Reifenhäuser
H. Herchenbach
Inventors.

By Karl F. Ross
Attorney



Inventors:
Hans Reifenhäuser
Horst G. Keferstein
Friedrich A. Reifenhäuser
Heinz Herchenbach

Karl F. Ross Attorney

APPARATUS FOR WINDING CONTINUOUSLY PRODUCED LAYER MATERIAL ON ELONGATED CORE

Our invention relates to an apparatus for winding continuously produced layer material on an elongated core, in particular for synthetic-resin film, foils or sheet material.

BACKGROUND OF THE INVENTION

Synthetic-resin foils, films and sheets are usually continuously extruded or otherwise produced, and must be wound on elongated sleevelike cores for shipping, storage and sale.

Devices are known for winding such film on cores. These devices usually require slipping the core, which is generally made of cardboard, synthetic resin or metal, over a steel shaft into a winding apparatus where sufficient material is wound on the core. Then the material is cut, the finished coil is removed from the shaft and a new core is applied to the latter.

Most of these steps are carried out manually, an operator placing the cores in the winding apparatus and unloading them therefrom. Removal of these shafts, as well as the original slipping on the cores, is also a manual operation; in addition, this manual process often entails a sizable waste of material during changing of cores.

OBJECTS OF THE INVENTION

It is therefore the principal object of our invention to provide a fully automatic apparatus for winding continuously produced layer material on an elongated core.

A further object is to provide an improved apparatus for the purpose described which obviates the need of slipping the cores on respective shafts prior to winding.

A yet further object is to make such a device which can work with exceedingly high winding speeds without wasting material during core changeover.

BRIEF DESCRIPTION OF THE INVENTION

We attain these objects by providing an apparatus wherein the core is moved between four main positions. The first of these positions is in a magazine. From there it is moved by two loading arms which engage its ends into its second position in a cradle formed by several rollers at a winding station. Here the surface of the core is brought into contact with the film which is at least partly wound thereon. After being freed by the loading arms it is in its third position, engaged by two gripper ends of two transport arms. One of these gripper ends is provided with a drive arrangement to rotate the core. As material is wound on the core, the transport arms are swung through an upright dead center position into an extreme position (the fourth and final one) where the wound core is set in an unloading station. A cutting device cuts the film while another core is fed into the cradle formed by the rollers of the winding station, and the transport arms disengage the wound core and return to grip the new core.

Our invention works automatically and efficiently since the core is first gripped axially by the loading arms and then set in a cradle formed by three rollers which engage it along its length. Then the loading arms return to their rest position and the transport arms take over gripping the ends of the core. In this manner the functions of the several devices do not interfere with each other.

Once the core has begun winding and is gripped by the transport arms, one of the rollers (i.e. a roller in the discharge or removal path of the finished core) is swung out of the way to allow for the material to wind up and build up on the core.

The novel use of two transport arms with a dead center position provides for an automatic, simple, and rapid unloading of the apparatus.

One of the rollers forming the cradle is driven so that winding occurs even while the transport arms are unloading the previous core and returning. One of the arm-gripper portions is also driven synchronously to ensure constant turning of the core. This constant winding makes for completely continuous and automatic operation.

The transport arms each simply engage the end of the core, preferably with a centering cone. Thus no steel shaft need be slipped through the core. Furthermore, one of the cones can be of the expandable type to grip the end of the core firmly.

The cradle formed by the rollers can be further formed by a belt around these rollers.

BRIEF DESCRIPTION OF THE DRAWING

The above and other objects, features, and advantages of our invention will be more fully described hereinafter, with reference to the drawing in which:

FIG. 1 shows a side view of an apparatus embodying our invention;

FIG. 2 is a view taken along line II—II of FIG. 1;

FIG. 2*a* is a detail view of FIG. 2, in section;

FIG. 3–7 are diagrams showing progressive steps carried out by our apparatus;

FIG. 8 is a view of an alternative embodiment of our invention; and

FIG. 9 is a top view of a detail of our invention.

SPECIFIC DESCRIPTION

As shown in FIG. 1 our apparatus comprises a housing 1 which is mounted on leveler screws 27 and on which a magazine 4 holding empty cardboard cores 3, having a contact adhesive along its surface, is mounted. A cylinder 20 energized by control means in the form of a programmer 37 operates three interconnected arms 21, 22 and 23 which allow one core 3 to drop out of the magazine 4 at a time. As arm 21 is drawn to the right, the roller of arm 23 passes between the core to be discharged and the core behind it. The arm 22 lifts to release the forwardly forward core. A programmer of this type has been disclosed, for example, in U.S. Pat. No. 2,520,826.

As the cores 3 leave the magazine they are gripped between centering cones 8*a* on a loading arms 8 (see FIG. 9) shifted inwardly by cylinders 54 also controlled by the programmer 37. Thence they are received in a cradle 2 formed by two rollers 12 and 13. Roller 12 is driven by a motor 26. Two arms 6 with gripper portions 7 are pivoted at 50 and are controlled by a large pneumatic cylinder 19*b* also controlled by the programmer 37.

A further pneumatic cylinder 19*c* controls the pivoting of a lock or retaining roller 14, mounted between two plates 24, and a cylinder 36 controls the pivoting of an arm 51 on which a cutter 5 and an elongated compressed air nozzle 17 are mounted.

FIGS. 2 and 2*a* show in greater detail the construction of the transport or winding arms 6 which are displaced toward and away from each other by cylinders 35. The right-hand arm 6 merely has a self-centering cone 7*a* which fits in the sleevelike core 3. The other arm 6 is equipped with a spreadable cone or gripper member 7 and is driven by a motor 45 (see FIG. 1).

This motor 45 drives a belt 31 (see FIG. 2) carried on a pulley 30 mounted on a gear 29 which meshes with a gear 28 that drives the cone 7. This cone 7 has a sleeve 42 which is formed outward by a spring 41 over a plurality of elements 39 held apart by a spring 44 and pivoted at 40. As the sleeve 42 is pressed back by the core 3 when the arm 6 is moved inwardly by the respective cylinder 35, these members 39 spread and firmly engage the interior of the core 3. The whole device rotates on a shaft 43 fixed to the gear 28.

Instead of the rollers 12 and 13 forming a cradle 2, two belts 12*b* and 13*b* stretched respectively over rollers 12*a* and 13*a* can form a cradle 2*a* as shown in FIG. 8. Here larger cores 3 can be wound, and even the lock roller 14 can be dispensed with.

Our apparatus functions and is used as follows:

As shown in FIG. 3, a core 3 is first fed into the cradle 2 and gripped by the arms 6. A sheet 10 of continuously produced material is fed over a roller 15, also serving as a counter for the programmer 37, and over the rollers 12 and 13 and is

wound around the core 3. This core 3 is provided with pressure adhesive. Then the motor 45 is actuated and the winding commences.

FIG. 4 shows how the arms 6 move from an extreme right-hand position through an upright dead center position to an extreme left-hand position, thereby stretching the sheet 10 merely over the upper idler roller 13.

At this point the programmer actuates the cylinder 20 and the arms 8 to bring another core 3 down into the cradle 2 as shown in FIG. 5. Even in this position, the sheet 10 continues to wind.

FIG. 6 shows how at substantially the same time the cutter 5 swings up stretching and deflecting the sheet 10 over two small rollers 33 and cutting it with a blade 32 while the roller 14 is pivoted up to hold the core 3 in the cradle 2. The nozzle 17 directs a blast of air to fold the cut end of the sheet 10 over the core 3. With to the motor 36 driving the roller 12, the winding still continues. The roller 14 is advantageously rubber covered to prevent axial shifting of the core 3.

Immediately thereafter, the arms 8 swing up to their FIG. 1 position and the arms 6 disengage a wound roll 9 on an unloading station 11 comprising a frame 18 on wheels 34 (FIG. 7) and swing back to engage the ends of the new core 3. Once the new core 3 is firmly gripped between the gripper portions 7 of the arms 6, the roller 14 can also swing back to its FIG. 1 position.

All of these actions are sequentially triggered by the programmer 37. A counter connected to the roller 15 and limit switches serve to trigger this control device 37.

In this embodiment the amount of material wound on the core 3 is determined by the dead center position, since the arms 6 swing over and unload once this position is reached. It is also possible to determine the amount of material wound on the core 3 by means of the counter on the roller 15 in conjunction with the programmer 37. The dead center position can be limitedly adjusted by means of the levelers 27.

As is also apparent visible, once the wound roll 9 is sizeably greater in diameter than the core 3, it rolls only on the driven roller 12 without contacting the idler roller 13 whereby the diameter of the roller 13 also determines to a certain extent the amount of material wound on the core 3.

It is worth nothing that as the core 3 is passed from magazine 4 to cradle 2 and thence on the arms 6 to the unloading station 11, it is gripped first axially, then along its length, and then axially again so that a smooth passage is possible with our apparatus.

The unloading station 11 is advantageously a small wagon. It can be a conveyor belt or other such device, but a wagon allows transporting of the individual rolls 9 with minimal difficulties. Some pressure in the cylinder 19*b* can make for a nonvertical dead center position while preventing too brusque a dropping of the fully wound roll 9.

The improvement described and illustrated is believed to admit of many modifications within the ability of persons skilled in the art, all such modifications being considered within the spirit and scope of the invention except as limited by the appended claims.

We claim:

1. An apparatus for winding a continuous web on elongated cores, comprising:

a pair of roller means having parallel axes and spaced-apart peripheries to define a cradle between them;

a pair of transport arms pivotal about a common axis substantially parallel to the axes of said roller means and having gripper portions axially engageable with respective ends of a succession of cores for swinging movement between a first extreme position wherein said arms engage a fresh core for the winding of said web therein in contact with said roller means and a second extreme position wherein a wound core carried by said arms is remote from said cradle, at least one of said gripper portions being rotatably driven;

a roller rotatable about an axis parallel to the aforesaid axes and swingable toward and away from said cradle for temporarily retaining a core therein for engagement by said arms; and

cutter means operatively connected with said roller and adjacent same for severing said web upon introduction of a fresh core into said cradle in said other position of said arms while said roller retains said fresh core in said cradle, said cutter means including means for deflecting said web between a fresh core at said cradle and a wound core carried by said arms.

2. The apparatus defined in claim 1 wherein each of said gripper portions includes a centering cone rotatably mounted on the respective arm, said apparatus further comprising means for driving at least one of said centering cones and means for axially shifting at least one of said centering cones toward and away from the other.

3. An apparatus as defined in claim 2 wherein the last-mentioned means includes means for shifting at least one of said arms along the pivot axis thereof.