

[54] **APPARATUS FOR ATTACHING A PRINTING FOIL OR MASTER TO THE CYLINDER OF A PRINTING MACHINE**

3,491,684 1/1970 Borinsky 101/451 X
3,682,095 8/1972 Kaminstein 101/463

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[51] Int. Cl. **B41f 27/12**

[58] **Field of Search** 101/415.1, 375, 378,
101/136-140, 141-145, 132, 132.5, 418

[56] **References Cited**

UNITED STATES PATENTS

1,760,152 5/1930 Lorentzen 101/141 UX

[57]

ABSTRACT

The present apparatus greatly facilitates the handling of the printing foil or sheet material of which a printing master is produced for use in printing machines such as office offset machines. The foil handling means include a first pair of rollers arranged inside a hollow foil cylinder for paying out a length of foil. First clamping means are provided for securing the leading edge of the foil to said cylinder. Second clamping means are provided for clamping down a portion of the foil which after severing becomes the trailing edge of the preceding master and the leading edge of the next following master. For this purpose the second clamping means are combined with severing means.

12 Claims, 9 Drawing Figures

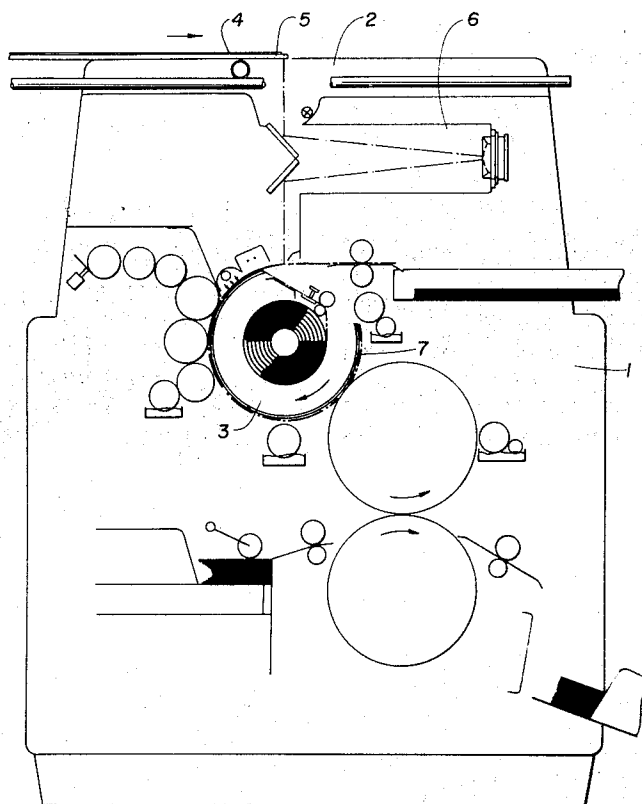
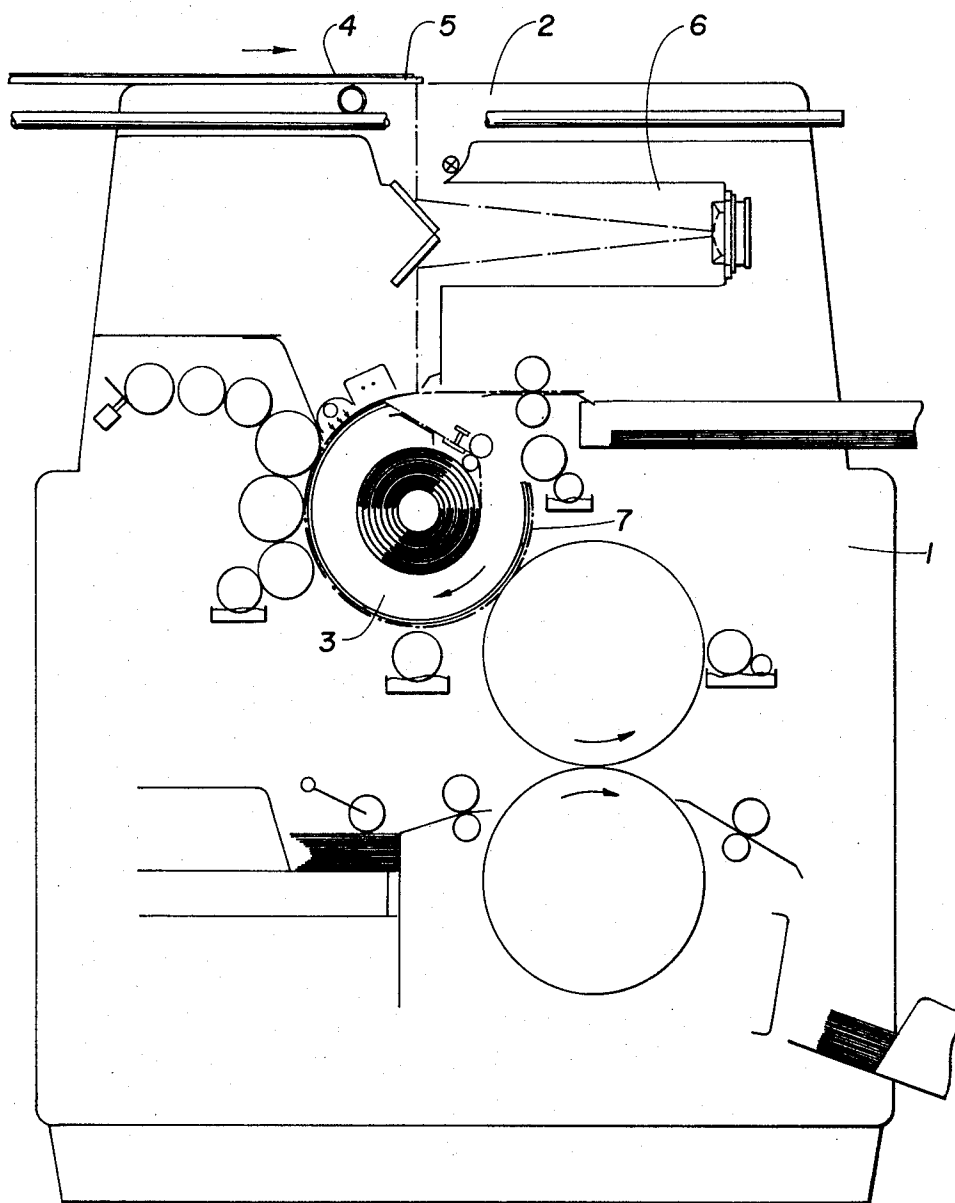


FIG. 1



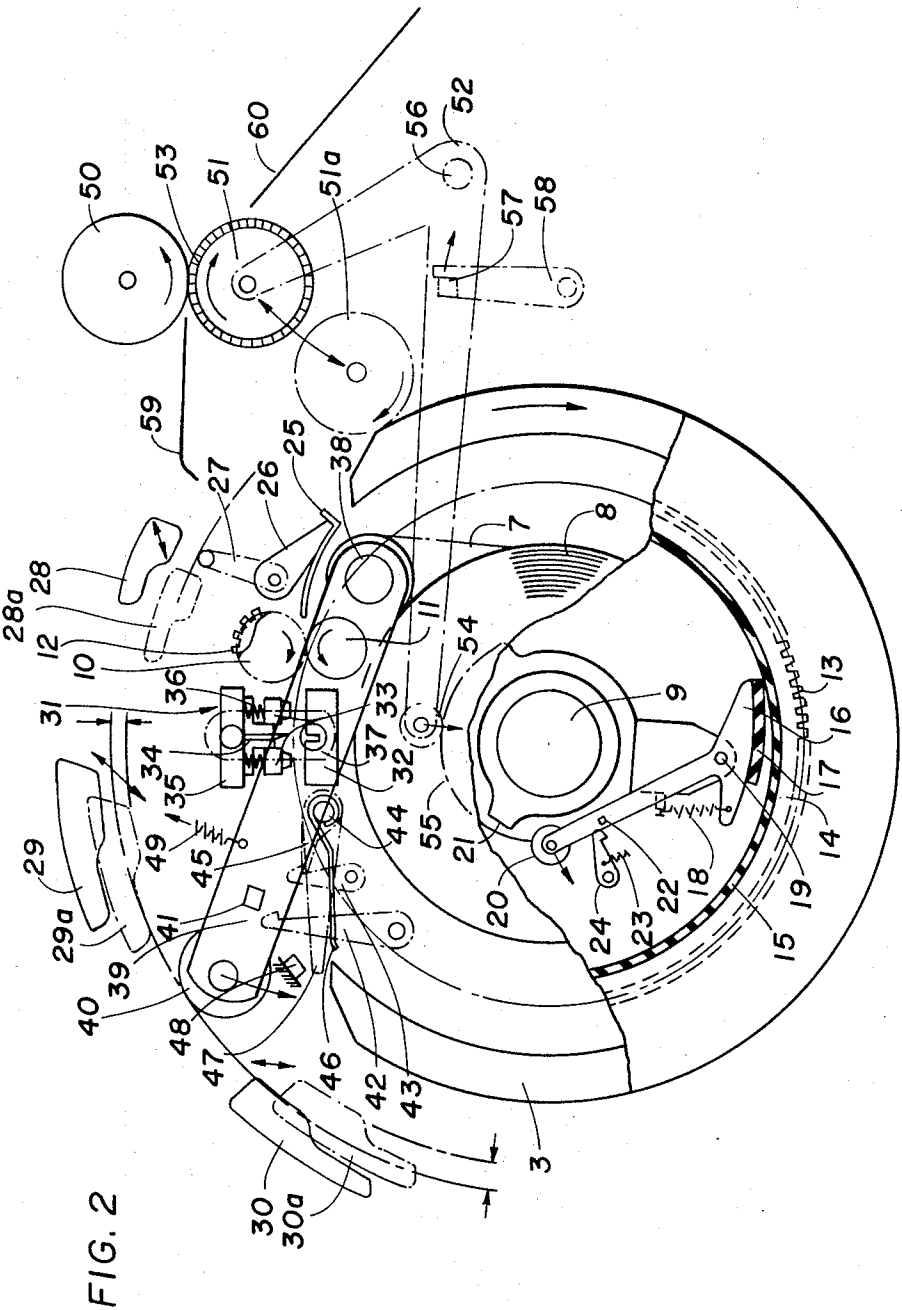


FIG. 3

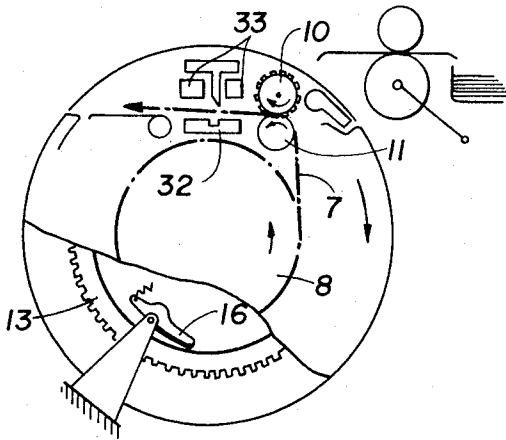


FIG. 4

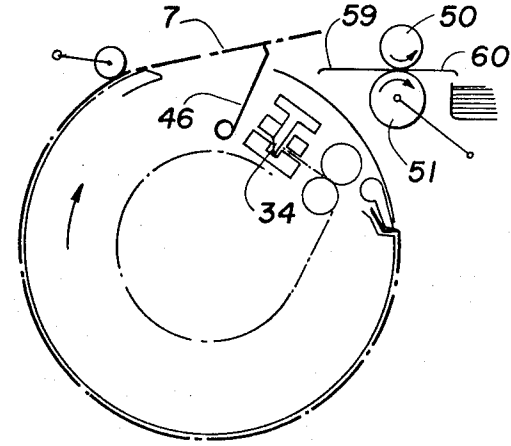
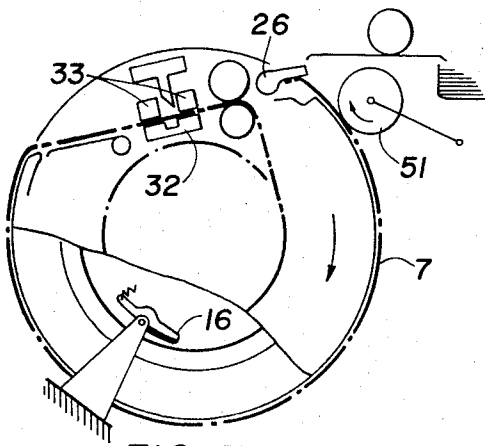
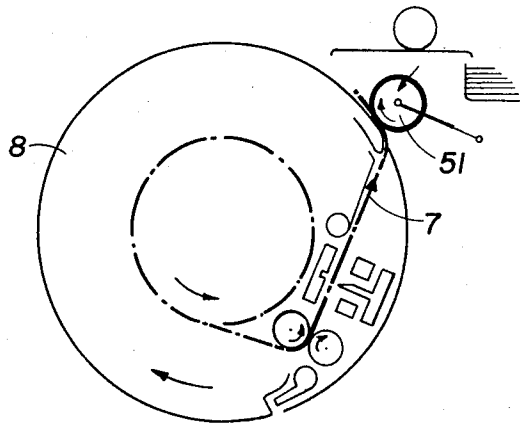


FIG. 5

FIG. 6

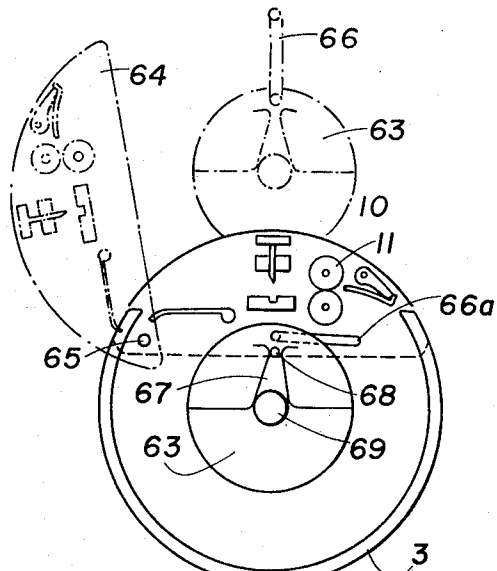
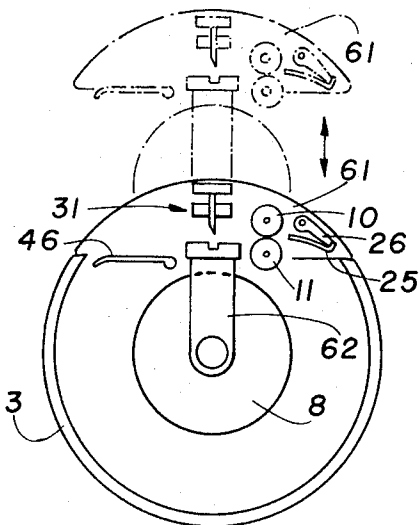
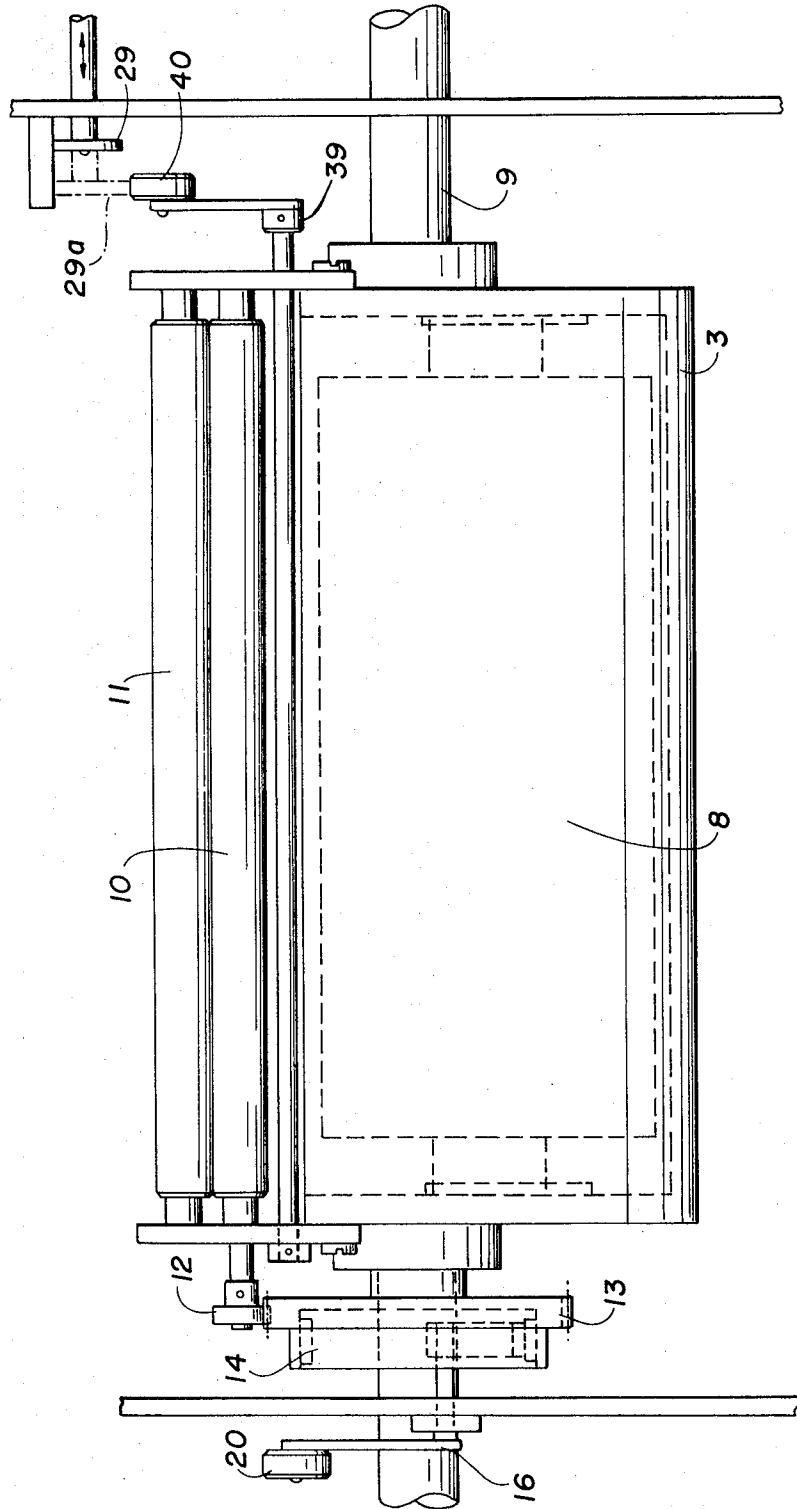


FIG. 8

FIG. 9

FIG. 7



APPARATUS FOR ATTACHING A PRINTING FOIL OR MASTER TO THE CYLINDER OF A PRINTING MACHINE

BACKGROUND OF THE INVENTION

The invention relates to an apparatus for attaching or clamping a printing foil onto the cylinder of a printing machine and for ejecting the printing foil after the printing process has been completed. For example, the invention is particularly suitable as part of an office offset printing machine which is also equipped for preparing the printing foil or master, for example, by an electrostatic process.

The German Pat. Publication DAS 1,283,249 shows an offset printing machine with a mechanism for feeding and ejecting printing foils. This arrangement takes up relatively much space whereby the printing foils are supplied individually to the machine. The entails considerable difficulties, particularly in the case of a combination machine such as described above.

U.S. Pat. No. 3,491,684 discloses a combination type machine equipped for the preparation of printing forms from an original to be duplicated and for making a plurality of copies from this printing form. In this known apparatus, the printing form material is fed from a supply roll located inside a cylinder over part of the cylinder surface back into the inside of the cylinder where it is wound up again on a take-up spool. Because of the two-spool arrangement in one cylinder, a cylinder of unusually large diameter for this type of machine is required, whereby only a small part of its surface is used to support the printing form. Aside from the large space required by such a machine, the reloading process is tedious and time consuming in that each time the starting end of the feed roll must manually be led out of the cylinder, around it and back into the cylinder and onto the take-up spool. This makes it difficult to obtain a smooth wrinkle-free contact of the printing form on the cylinder.

OBJECTS OF THE INVENTION

In view of the above, it is the aim of the invention to achieve the following objects singly or in combination:

to provide a mechanism for the automatic attachment and ejection of a printing foil such that it is compact and economical;

to avoid the individual feeding of the printing forms;

to provide a mechanism which will assure that the printing form is attached smoothly and free of wrinkles to the cylinder whereby both of its ends are clamped down automatically;

to provide means for automatically severing the foil and for automatically ejecting the used-up foil;

to provide means for clamping down both ends of the foil; and

to provide a cartridge for the foil which may be inserted into the foil cylinder of the printing machine.

SUMMARY OF THE INVENTION

According to the invention there is provided an apparatus for attaching a printing foil or master to the cylinder of a printing machine, wherein a freely rotatable foil supply roll is supported inside the foil cylinder, wherein means are provided for paying out foil from the cylinder, for clamping down both ends of the foil, for severing a length of foil, and wherein an ejecting mechanism is provided for removing the foils from the

cylinder. The invention assures automatically a wrinkle-free positioning of the foil on the cylinder whereby both ends are clamped down as well as the ejection of the used-up foils by means of the same mechanism which is essentially located within the confines of a foil cylinder of normal size, thus requiring little additional space. The wrinkle-free clamping is especially advantageous where the exposure of an electrostatic printing foil requires a perfectly smooth contact with the supporting cylinder.

BRIEF FIGURE DESCRIPTION

In order that the invention may be clearly understood, it will now be described, by way of example, with reference to the accompanying drawings, wherein:

FIG. 1 shows an office offset printing machine incorporating means for producing printing forms or masters and indicating schematically the mechanisms according to the invention;

FIG. 2 shows a side view, in several planes, of the mechanism according to the invention;

FIGS. 3 to 6 illustrate different phases of the action sequence or operation of the present mechanism;

FIG. 7 is a front view of the present apparatus supplementing the view of FIG. 2;

FIG. 8 shows the arrangement of the foil supply roll in an exchangeable insert; and

FIG. 9 illustrates the arrangement of a supply roll in a cartridge inserted into the foil cylinder.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

FIG. 1 shows an office offset printing machine 1 combined with means 2 for electrostatic copying. The offset printing machine is of conventional structure, however, it is equipped with a mechanism according to the present invention which is essentially arranged within the area of a foil cylinder 3. An original 4 supported by a carriage 5 is projected by an optical system 6 onto the foil 7 which is attached to the cylinder 3. The foil cylinder 3 is surrounded by equipment for developing the foil by any well-known electrostatic process into a printing form or master. Subsequently the printing process itself is performed by the well-known offset method.

FIG. 2 shows the foil cylinder 3 in which a supply roll 8 of foil 7 is mounted such that it may be freely rotated. A freely rotatable pair of rollers 10 and 11 are also mounted inside the foil cylinder 3. Rollers 10 and 11 rotate in opposite directions whereby the movement at the point of cooperation of these rollers with each other is in the same direction. One end of the roller 10 is rigidly connected to a gear wheel 12 which meshes with a further gear wheel 13 which in turn is rigidly attached to a clutch housing 14. This housing 14 has a friction lining 15 on the inside and is rotatably mounted on the cylinder axis 9 for rotation independently of the cylinder 3. A clutch lever 16 also having a friction lining 17 and a tension spring 18 is mounted on a shaft 19 secured to a side frame member. The clutch lever 16 is actuated through a roller 20 and through a cam 21 which is secured to the cylinder shaft 9. The clutch lever 16 is further equipped with a lock bolt 22 which may be engaged by a latch pawl 24 mounted under the tension of a spring 23 to the side wall of the foil cylinder 3. The latch pawl 24 may be actuated by a programmed control mechanism not shown in the drawing.

The transmission ratio of the gear wheels 12 and 13 is such that the circumferential velocity of the roller 10 corresponds to that of the foil cylinder 3.

A guide bar 25 secured to the cylinder 3 serves for the insertion of the end of the foil 7 between the transport rollers 10 and 11. A spring loaded clamping bar 26 is journaled to the cylinder 3 and rigidly connected to a roller lever 27. The clamping bar 26 rests on top of the guide bar 25. Axially movable, program controlled, electromagnetically actuatable cams 28, 29 and 30 are mounted in the side portion of the machine. These cams are shown in their active or effective positions 28a, 29a and 30a by dashed lines and in their neutral positions by solid lines.

A combined clamping and cutting device 31 is mounted on the inside of the foil cylinder 3 and rotates with the cylinder. This device 31 comprises a base 32, a two-piece hold-down member 33, a cutting blade 34 guided and supported within the member 33 by a cross bar 35 and compression springs 36. The hold-down bar 33 and the knife 34 are connected to each other at both ends of the device by connecting members 37. One of these connecting members 37 is linked to a lever 39 which carries a roller 40. The lever 39 is journaled to a stud 38 on a side wall of the cylinder 3 and is held in its neutral or starting position by a tension spring 49. A lock bolt 41 is mounted on the lever 39 while a spring biased latch pawl 42 is journaled to the foil cylinder 3. Another spring biased latch pawl 43 also journaled to the side wall of the cylinder 3 cooperates with a lever 45 which is mounted on a shaft 44. A comblike ejection rake 46 and a further lever 47 which cooperates with a frame lug 48 are also mounted on the shaft 44. A pair of rollers 50 and 51 are mounted outside of the foil cylinder 3 between the side frame members of the machine. The roller 50 is freely rotatable between said side frame members, while the roller 51 which is provided with positive drive means is mounted on one end of a rocker lever 52. The roller 51 is provided with a felt cover 53 and rotates in the same direction as the foil cylinder 3, whereby the movement of the foil cylinder 3 and of the roller 51 at the point of their cooperation is in opposite directions. The rocker lever 52 is journaled on an axis 56 and carries at its other end a roller 54 which may be held under spring pressure against a cam disk 55 which is secured to the cylinder shaft 9. The rocker lever 52 carries a lock bolt 57 adjacent to its axis which cooperates with a program controlled locking pawl 58 pivotally supported and spring biased in the side frame members. Adjacent to the rollers 50 and 51 there are arranged guide plates 59 and 60 which are located between the side frame members of the machine.

FIG. 8 shows the foil cylinder 3 with an interchangeable segment shaped insert 61 which is provided with supports or bearing means 62 for the supply roll 8. The guide bar 25, the clamping bar 26, the pair of rollers 10 and 11, the combined clamping and cutting device 31 and the ejection rake 46 are also located in said insert.

FIG. 9 illustrates the exchange of a supply roll 8 by means of a cartridge 63. For this purpose a segment shaped lid 64 is hinged on an axis 65. The lid 64 comprises the same parts of the mechanism as depicted in FIG. 8, except for the supports of the supply roll. For ease of exchanging the cartridge 63 has a handle 66 which in the inserted position of the cartridge is maintained in a tilted back position 66a whereby it facili-

tates the automatic feeding of the starting end of the supply roll 8 into the roller pair 10 and 11.

To assure the correct loading of the cartridge into the foil cylinder 3 the side walls of the cartridge 63 are provided with guide grooves 67 which engage corresponding guide pins 68 and 69 on the foil cylinder 3.

The present apparatus operates as follows. In loading the supply roll 8 into the foil cylinder 3, first the starting end of the supply roll is inserted between the rollers 10 and 11 either by hand or automatically by using the cartridge containing the supply roll 8.

In the decoupled mode the clutch housing 14 which is supported to freely rotate on cylinder axis 9 is entrained by the gear wheel 12 which meshes with the gear wheel 13 of the clutch housing 14. Thus, the clutch housing 14 rotates along with the foil cylinder 3. Lock pawl 24 is electromagnetically actuated through program control means whereby the pawl 24 is moved counter-clockwise for releasing the clutch lever 16 which now stops the rotation of the clutch housing 14 as shown in FIGS. 2 and 3. Since the foil cylinder 3 is rotating continuously the gear wheel 12 and the roller 10 are now also set into rotational motion. The foil 7 is spooled off or paid out from the supply roll 8 and moved between the base bar 32 and the hold-down bar 33 toward the outside surface of the rotating foil cylinder 3 (FIG. 3). As soon as the foil 7 reaches the outer surface of the foil cylinder 3 the roller 51 is lowered into contact with the foil and thus with the foil cylinder 3 whereby the foil engages the foil cylinder in a smooth wrinkle-free manner as the foil cylinder keeps rotating and whereby the roller 51 keeps the foil under light tension (FIG. 4). The lowering of the roller 51 into position 51a is program controlled through the release and clockwise rotation of the lock pawl 58, thereby releasing the cranked lever 52 which then is rotated counter clockwise about its axis 56 by a spring force. After an almost full revolution of the foil cylinder 3 its outer surface is covered by the foil 7 (FIG. 5). The cam 28 which is moved by program control means (not shown) into its position 28a momentarily opens or lifts through roller lever 27 the hold-down bar 26 which, after passage of the cam 28, is closed again by the force of a spring. In the interval between opening and closing of hold-down bar 26 the end of the foil is bent by the roller 51 around the edge of the cylinder mantle and held in position by the clamping bar 26 which is closed for this purpose. At this same time the roller 54 of the rocker lever 52 rolls up on the cam disk 55 whereby the lever 52 is rotated clockwise and the roller 51 is returned from its position 51a back into its original position. The locking pawl 58 and the locking bolt 57 arrest the lever 52 in this position.

The spring supported hold-down bar 33 is pressed against the base bar 32 by the cam 29 through the roller lever 39 whereby the foil 7 is held in position (FIG. 5). The roller lever 39 is held fixed in this position due to the engagement of lock pawl 42 and lock bolt 41. The foil 7 is now tightly wound on the foil cylinder 3 and held between clamping bar 26 and the hold-down bar 33. Simultaneously, the clutch lever 16 is rotated by the cooperation of the roller 20 and the cam disk 21 in a counterclockwise direction, whereby the locking pawl 24 engages the locking bolt 22. The clutch housing is released and the roller 10 is not driven any longer, thus stopping any further pay out of the foil 7. Meanwhile

the cams 28 and 29 have been moved back into neutral position by the program control means.

When the foil 7, which is clamped to the cylinder 3 is to be replaced by a new one, the cam 30 is moved into position 30a by the program control means. The roller lever 39 is rotated further counter-clockwise about its axis 38 due to the contact of the roller 40 with cam 30 in its position 30a. This rotation of the lever 39 lowers the knife 34 for cutting the foil 7. Simultaneously the lever 45 is released whereby the ejector rake 46 which is connected to the lever 45 turns clockwise thereby lifting the foil 7 as shown in FIG. 6. The rotating foil cylinder 3 then deposits the cut and lifted end of the foil 7 on a guide plate 59 inserting it between the rollers 50 and 51 which then take over the further transport of the foil. In the meantime the cam 28 is again moved into its position 28a whereby, after a further revolution of the foil cylinder 3, the clamping bar 26 is momentarily opened by the lever 27 thereby releasing the end of the foil 7 and the severed foil portion is then transported over a guide plate 60 into a receiving container.

As a result of the above operation the starting position of the ejector rake 46 is restored by the cooperation between the lever 47 which is connected to the rake 46 and a lug 48 fixed to the frame after a further revolution of the foil cylinder 3 whereby the lever 47 and with it the ejector rake 46 are rotated counter-clockwise and whereby the pawl 43 again locks the lever 47.

The apparatus is thus ready for paying out a new foil length the starting end of which is located in the clamping and cutting device 31 where it is held by the roller pair 10 and 11.

In view of the foregoing it will be appreciated that according to the invention the foil handling rollers 10, 11 are arranged inside the foil cylinder 3 and that such pair of rollers rotate along with the foil cylinder 3. These rollers are connected through a gear wheel drive to a clutch housing which is rotatably mounted on the cylinder axis and which may be coupled to the rollers by a clutch lever 16 pivoted to the frame structure.

According to a preferred embodiment of the invention the mechanism for clamping one end of the foil comprises said hold-down member 33 which is combined with the cutting device for separating the foil. The described ejector rake is preferably arranged for cooperation with the clamping and cutting mechanism for lifting the foil the rake is hinged to the foil cylinder.

A further pair of rollers are arranged for transporting the cut foil out of the cylinder. In order to facilitate a wrinkle-free positioning of the foil on the foil cylinder one of these rollers is arranged to be lowered against the foil cylinder. This movable roller 51 rotates in the same direction as the foil cylinder 3 to provide a counter movement at the point of cooperation between the foil cylinder 3 and the roller 51. Preferably, the roller 51 is covered with a felt sheath which has the advantage that the foil is handled with care.

Another advantage of the invention is seen in that an interchangeable segment shaped insert carrying the bearings for the supply roll of foil is located in the foil cylinder together with said pair of rollers 10 and 11 for the transport of the foil, the clamping and cutting mechanism and the ejecting rake for lifting the cut foil, because this not only provides a compact structure, it also assures an easy access to all elements.

A further preferred embodiment of the invention employs a cartridge in which the roll of foil is located and which is insertable into the foil cylinder. This allows a particularly simple loading or insertion of the supply roll in that the cartridge may be constructed in such a way that the starting end of the foil is automatically inserted between the transport rollers for the pay out of foil. An especially easy insertion of the supply roll of foil or the cartridge is achieved by providing the foil cylinder with a segment shaped lid.

Although the invention has been described with reference to specific example embodiments, it is to be understood, that it is intended to cover all modifications and equivalents within the scope of the appended claims.

What is claimed is:

1. An apparatus for attaching a printing master made from sheet or foil material paid out from a supply roll to a cylinder of a printing machine and for ejecting said master after the printing run, comprising a hollow cylinder, means for rotatably supporting and driving said hollow cylinder in said apparatus, means for rotatably supporting said supply roll inside said hollow cylinder, means for paying out sheet material from said supply roll out of said hollow cylinder, means for clamping a length of sheet material at both ends thereof, severing means arranged for severing said length of sheet material from said supply roll, and means for ejecting the severed length of sheet material from said hollow cylinder.

2. The apparatus according to claim 1, wherein said means for paying out sheet material comprise a pair of rollers, means for rotatably supporting said pair of rollers inside said hollow cylinder, means for positively driving said pair of rollers together with said hollow cylinder, said means for positively driving said pair of rollers comprising a gear wheel train, clutch means for coupling said gear wheel train to said hollow cylinder, and actuator means for engaging and disengaging said clutch means with said hollow cylinder.

3. The apparatus according to claim 1, wherein said clamping means comprise hold-down means, said severing means comprising a cutting blade, said apparatus further comprising means for coupling said hold-down means and said cutting blade to each other.

4. The apparatus according to claim 3, wherein said hold-down means comprise two hold-down bars arranged in parallel to each other and spaced from each other to provide a gap therebetween, and means for supporting said cutting blade for movement into said gap, whereby one of said hold-down bars secures a portion of the sheet material which after the severing becomes the trailing edge of said length of sheet material while the other of said hold-down bars secures a portion of the sheet material which after said severing becomes the leading edge of the next succeeding length of sheet material.

5. The apparatus according to claim 1, wherein said ejecting means comprise an ejecting rake, means for rotatably supporting said ejecting rake adjacent to said clamping and severing means and means for tilting said ejecting rake into and out of a sheet lifting position.

6. The apparatus according to claim 1, further comprising means for transporting said length of sheet material out of said hollow cylinder, said transporting means comprising a further pair of rollers and means

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for rotatably supporting said further pair of rollers outside of said hollow cylinder.

7. The apparatus according to claim 6, wherein said means for rotatably supporting said further pair of rollers comprises rocker arm means carrying at one end thereof one roller of said further pair of rollers, means for operating said rocker arm whereby said one roller may be tilted against the hollow cylinder, and means for positively driving said one roller of said further pair of rollers in the same direction of rotation as said hollow cylinder whereby said one roller and said hollow cylinder move in the same direction at the point of co-operation.

8. The apparatus according to claim 7, wherein said one roller comprises a felt cover on its outer cylindrical surface.

9. The apparatus according to claim 1, wherein said

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hollow cylinder comprises an interchangeable insert member, said insert member comprising means for supporting said supply roll, said means for paying out sheet material, said clamping and severing means, as well as said ejecting means, whereby these means just listed are exchangeable together with said insert member.

10. The apparatus according to claim 9, further comprising hinge means for hinging said insert member to said hollow cylinder.

11. The apparatus according to claim 1, further comprising cartridge means for inserting said supply roll into said hollow cylinder.

12. The apparatus according to claim 1, further comprising a segment shaped lid for said hollow cylinder for facilitating the insertion of said supply roll into said cylinder.

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