

[54] WINDING APPARATUS

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[51] Int. Cl. **B65h 17/00, B65h 27/00**

[58] Field of Search **242/67.1 R, 67.3 R, 68.3,
242/68.4, 76, 77.1**

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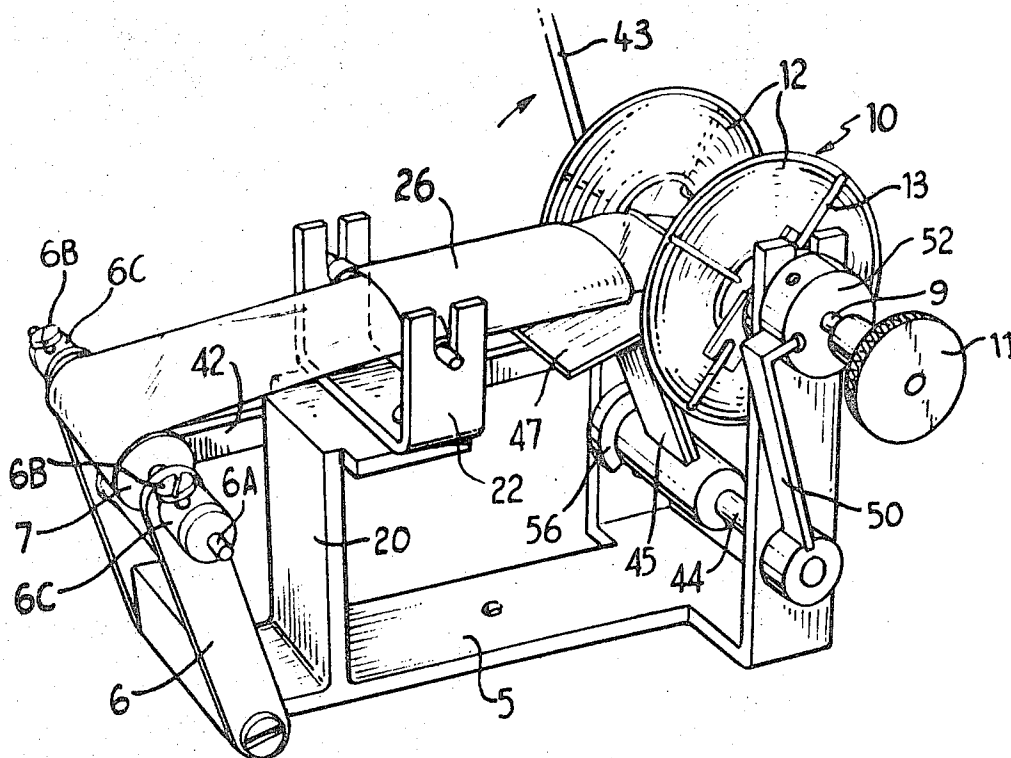
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[57]

ABSTRACT

Apparatus for use in winding strip material on to a reel the ends of which are provided with spiral slots or grooves and are spaced apart by a distance slightly less than the width of the strip. The apparatus comprises means for supporting the reel, means for supporting the strip material in a delivery position, and means for curving the strip material to reduce its width to less than the spacing of the ends of the reel, guide means guide the free end of the strip material into register with retaining means at the centre of the reel, and means are provided for flattening the strip material at such location, the reel is rotated to wind the strip material on to it with the edges of the strip material engaged in said slots or grooves and the coils of the strip material spaced from one another.

16 Claims, 8 Drawing Figures



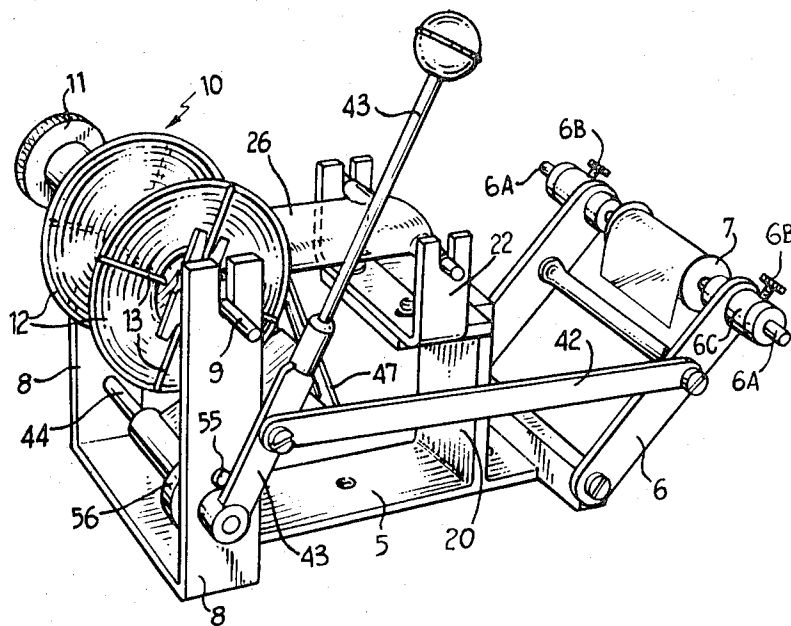


FIG. 1

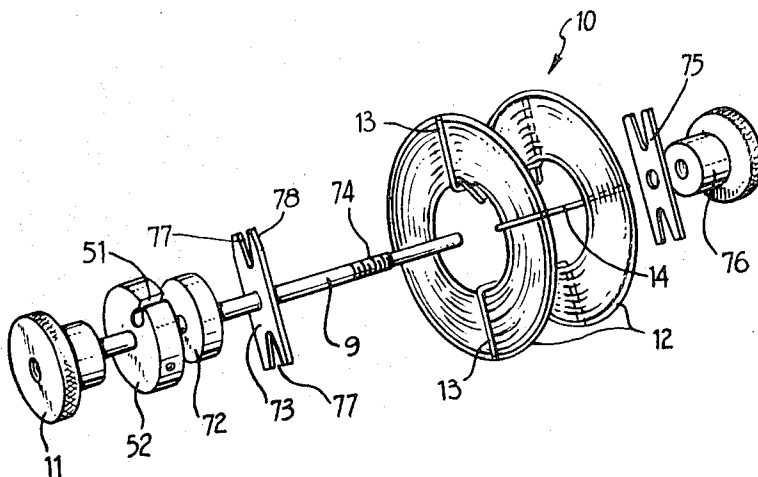


FIG. 8

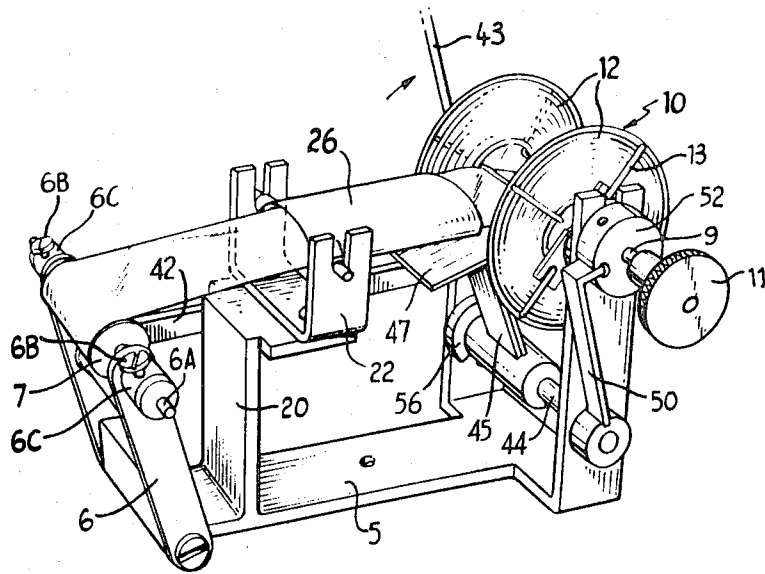


FIG. 2

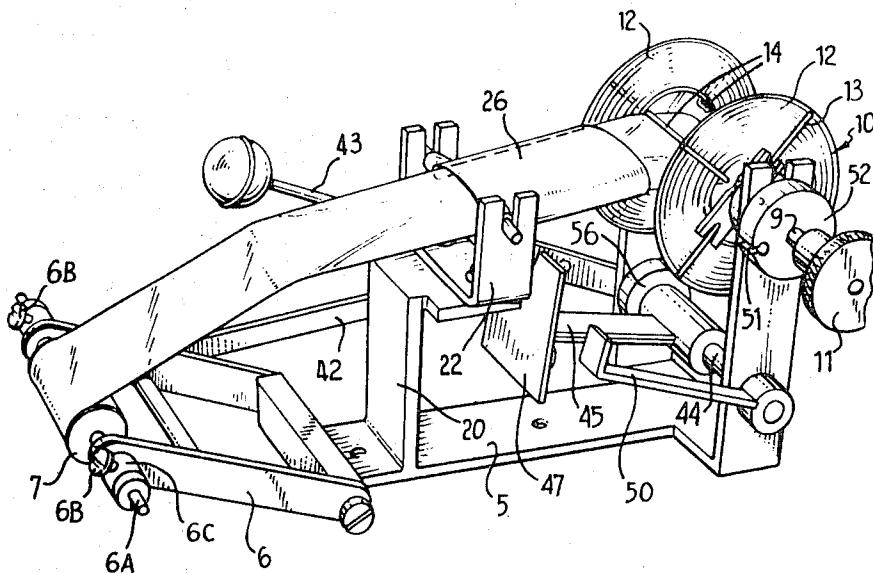
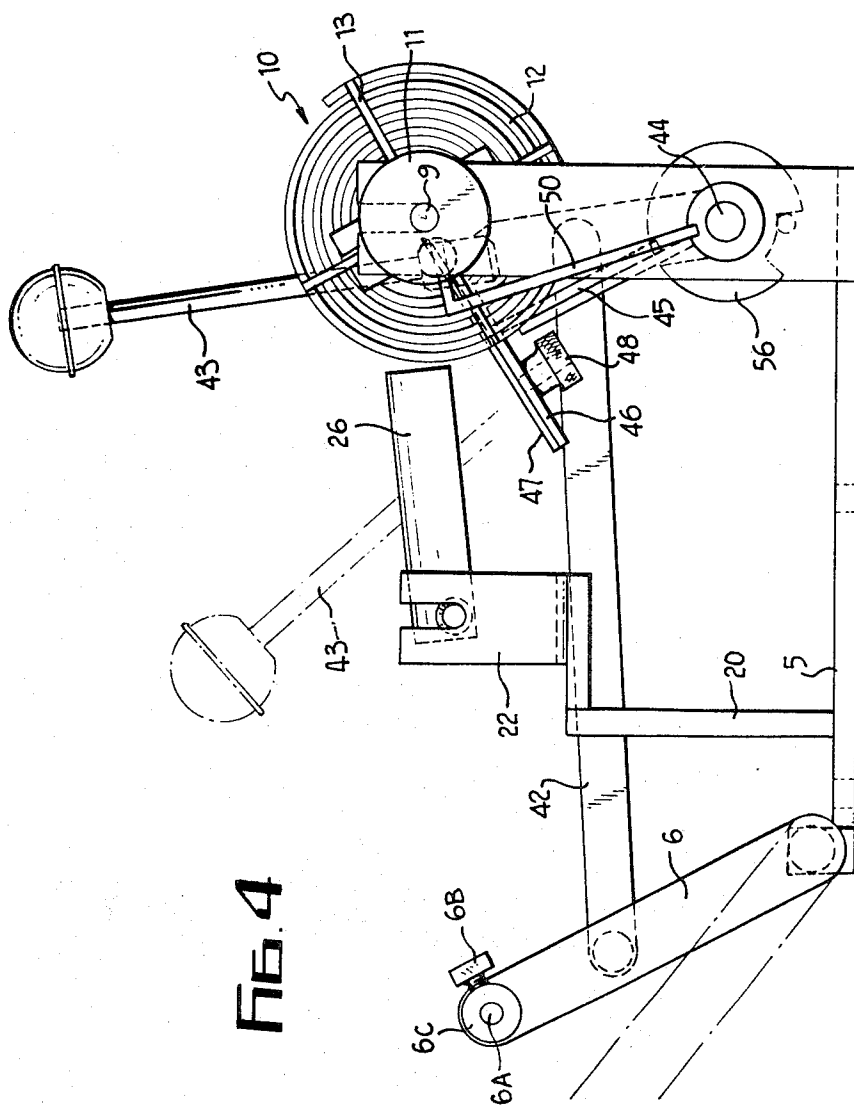


FIG. 3



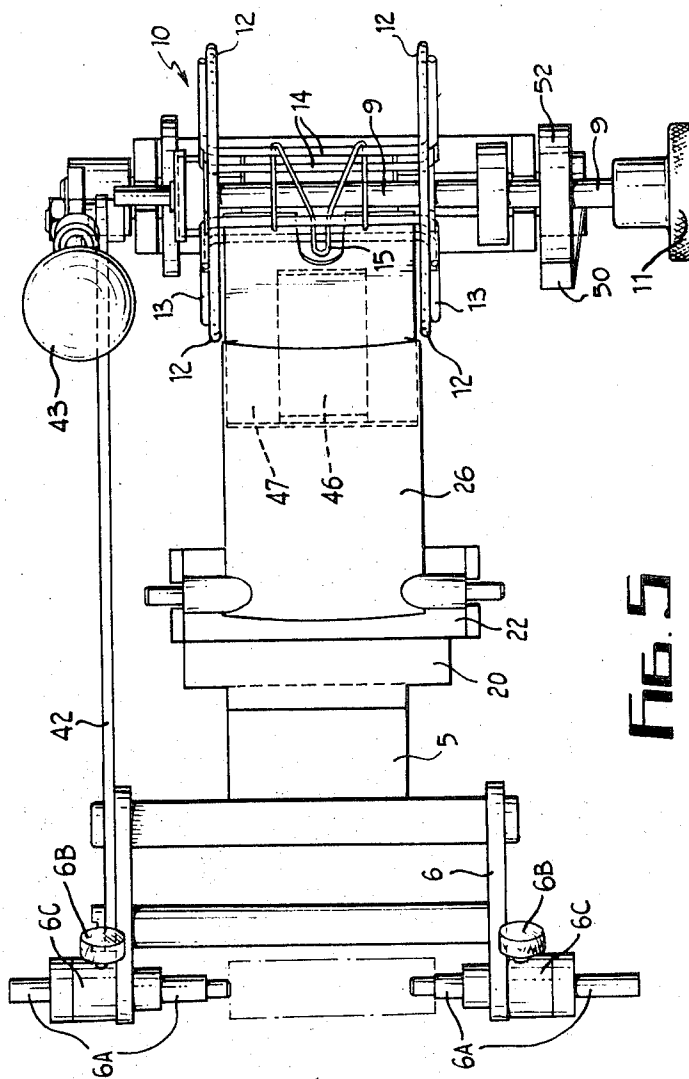


FIG. 5

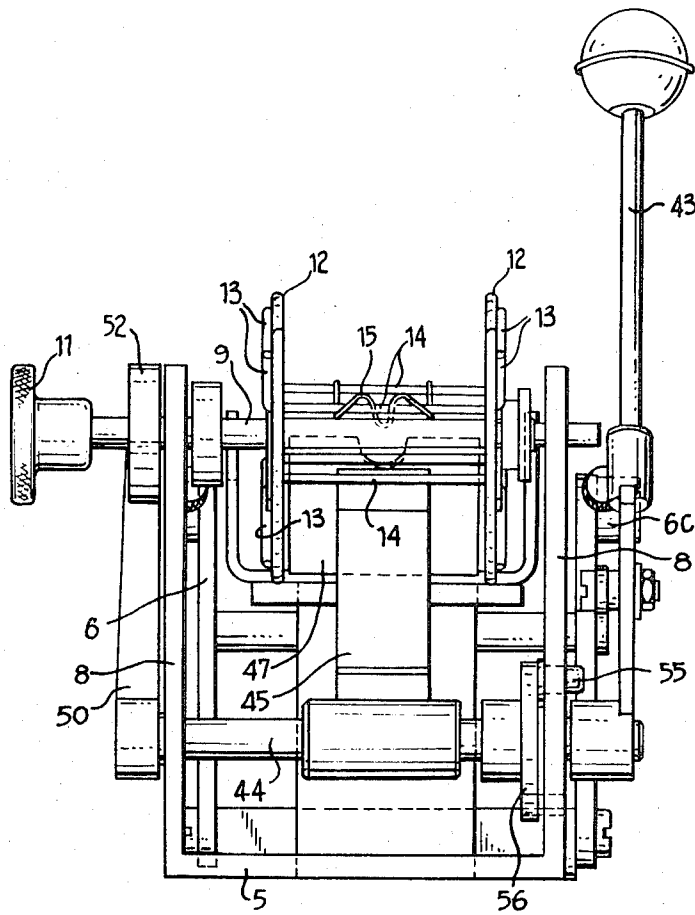


FIG. 6

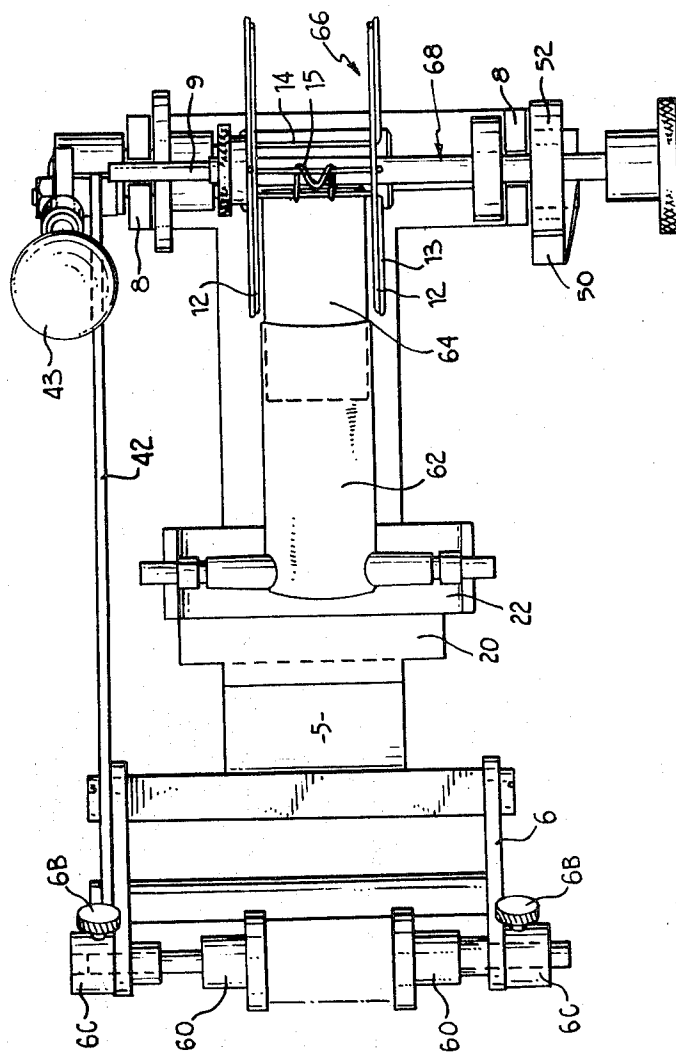


FIG. 7

WINDING APPARATUS

The invention relates to devices for winding strip material on to reels.

In preparing photographic film for developing it requires to be wound on to a reel in such a manner that the coils of film are spaced apart to enable developer to contact all the surfaces of the film. For this purpose the ends of the reel are provided with spiral slots or grooves and are spaced apart by a distance slightly less than the width of the film such that the edges of the film lie in the slots or grooves which thereby support the coils in spaced relation.

A severe drawback of such reels is that it is very difficult to wind on the film without damaging the emulsion surfaces. This is especially the case where relatively wide films are concerned and is aggravated by the fact that the operation must be carried out in the dark. It is an object of the present invention to obviate or mitigate this disadvantage.

The invention provides apparatus for use in winding strip material on to a reel the ends of which are provided with spiral slots or grooves and are spaced apart by a distance slightly less than the width of the strip, the apparatus comprising means for supporting the reel, means for supporting the strip material in a delivery position, means for curving the strip material to reduce its width to less than the spacing of the ends of the reel, means for guiding the free end of the strip material into register with retaining means at the centre of the reel, means for flattening the strip material at such location, and means for rotating the reel to wind the strip material on to it with the edges of the strip material engaged in said slots or grooves and the coils of the strip material spaced from one another.

Preferably the apparatus includes a carrier on which a spool of the strip material, for example photographic film, may be rotatably mounted prior to its being wound on to the reel. The carrier may be movable between a substantially upright loading position and a lowered winding position thereby altering the angle of presentation of the strip material and the distance from the carrier to the reel.

Said means for curving the strip may comprise a plate curved to the desired extent and having inturned edges such that the strip material may be located under the plate with its edges engaged with the inturned edges of the plate, thereby constraining the strip material to bulge into contact with the curved under-surface of the plate.

Preferably the plate is pivotally mounted to permit changes in the angle of presentation of the strip material, and may be completely removable to permit engagement of the strip material with the plate while the latter is detached from the apparatus.

Said means for guiding the free end of the strip material and said means for flattening the strip material may comprise a deflector plate movable from a position clear of the ends of the reel to a position in which it is located between said ends and close to the centre of the reel, the deflector plate including strip supporting surfaces disposed adjacent the respective ends of the reel. The deflector plate may be angularly or slidably movable between said positions.

Advantageously means is provided to lock said reel in a predetermined loading position in which the retain-

ing means is correctly presented to the advancing strip material to facilitate initial engagement.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of one form of device for winding photographic film on to a developer reel;

FIG. 2 is a perspective view of the FIG. 1 embodiment viewed from the other side and with the parts disposed in a loading position;

FIG. 3 is a view similar to FIG. 2 showing the parts in a winding position;

FIGS. 4, 5 and 6 are respectively side, plan and front views of the device;

FIG. 7 is a plan view of the device adapted for narrower film; and

FIG. 8 is an exploded perspective view of a reel clamping assembly.

Referring to FIGS. 1 to 6 the apparatus includes a base 5 at one end of which is pivotally mounted a carrier 6 for a spool of film 7, and at the other end of which is mounted a pair of fixed supports 8 forming bearings for a shaft 9 on which the developer reel 10 is releasably clamped. The upstanding arms of the carrier 6 are fitted with removable spindles 6A which may be clamped by screws 6B in bosses 6C secured to the arms 6. The spindles engage in opposite ends of a spool to support it rotatably between the arms 6. The shaft 9 and the reel may be rotated by means of a hand wheel 11.

The developer reel is of known construction comprising a pair of ends 12 constructed from coiled wire with spaces between the coils. Radius arms 13 maintain the rigidity of the ends which are spaced apart by central bars 14 (FIGS. 3, 5 and 6) joining the radius arms. A spring clip 15 (FIGS. 5 and 6) is mounted on one of the bars 14 and engages an adjacent bar such that the free end of the film may be pushed between the bar and the clip at the commencement of winding.

Between the carrier 6 and the supports 8 is a pedestal member 20 on which a yoke 22 is supported. The yoke removably receives a combined curving and guiding member 26 with which the film is engaged in its passage from the spool 7 to the reel 10. The member 26 is of arcuate section and of a width just less than the distance between the ends of the reel. The side edges of the guide member are turned inwardly to retain the edges of the film and due to the difference in width of the film and the guide member the film is constrained to curve upwards beneath the guide member. In this way the effective width of the film is reduced.

A cross-shaft 44 is rotatably mounted at its opposite ends in the respective supports 8 and carries an arm 45 to which a support plate 46 is secured. A deflector plate 47 is detachably mounted on the plate 46 by a knurled nut member 48 (FIG. 4) engaged with a threaded stud depending from the plate 47 and passing through an aperture in the support plate. The support plate also carries an upstanding pin (not shown) engageable in a hole in the plate 47 and spaced from the axis of the stud to prevent rotation of the plate 47 about the axis of the stud. The width of the deflector plate 47 is such that in its raised operative position (FIG. 2) it may just pass between the ends of the reel 10. In its inoperative position it is swung clear of the reel about the shaft 44 to the position shown in FIG. 3.

As best seen in FIG. 1 one arm of the carrier 6 is coupled by means of a tie bar 42 to a hand lever 43 mounted on an extension of the cross-shaft 44. The end of shaft 44 opposite to the hand lever 43 carries a locking pawl 50 (FIGS. 2 and 3) engageable with a notch 51 in a collar 52 mounted on the spindle 9 on which the reel is carried to lock the latter in a rest position with the clip 15 on the reel correctly presented towards the film to be wound.

In operation the film spool is mounted on the spool carrier 6 with the hand lever 43 in the FIG. 2 position. In this position the spool carrier is in its substantially upright loading position and the deflector plate 47 is disposed between the ends of the reel. The reel is rotated till the pawl 50 engages the notch 51 and the parts are retained in this position by engagement of a spring-urged detent member projecting from the inner end of a holder 55 in a recess in a flange 56 mounted on the shaft 44. A similar recess is engaged by the detent member when the handle 43 is in its lowered position.

The film is fed forward from the spool, engaged under the guide plate 26 and slid over the deflector plate 47. The latter flattens the end of the film and enables it to slide beneath the clip 15 on the reel with its edges engaged in the spiral slot. The lever 43 is then moved to the winding position (FIG. 3) which simultaneously tilts the spool carrier away from the reel, swings the deflector plate 47 clear of the reel and disengages the pawl 50 from the collar 51 enabling rotation of the reel. Tilting of the spool carrier increases the length of the path between the spool and the reel and allows the film to adopt the best attitude as it is wound on to the reel. The increased distance between the spool and the guide plate 26 also facilitates the transition of the film between its flat and curved conditions. Winding on of the film is effected manually by rotation of the hand wheel 11.

It will be appreciated that the initial threading operation is relatively simple and that once this is completed the film winds automatically on to the reel as the latter is rotated. The loading operation may therefore be easily and quickly carried out in the dark with little danger of damage to the film.

FIG. 7 shows the adaptation of the apparatus for narrower film. For this purpose the spindles 9 are removed and replaced by end clamps 60 inserted into the bosses 6C from the inner sides of the spool carrier arms. The guide plate 26 is replaced by a narrower plate 62 and the deflector plate 47 by a narrower plate 64, and a reel 66 of the appropriate width is fitted to an alternative shaft and hand wheel assembly 68 mounted in the end supports 8. Operation of the apparatus is then identical to that using attachments for wider film. In this way a range of different sizes of film can be wound on the same apparatus, the maximum width being limited only by the width of the apparatus itself.

FIG. 8 shows an exploded view of the reel carrier spindle assembly. This comprises the central shaft 9 to one end of which the hand wheel 11, locking collar 52, a co-operating collar 72 and an end plate 73 are secured. The other end of the shaft is of reduced diameter and has a threaded section 74. A removable end plate 75 and lock nut 76 are provided such that after passing the shaft 9 through a reel until one end of the latter locates against the plate 73 the plate 75 may be

clamped against the other end of the reel by means of the nut 76. The end plates 73 and 76 are provided with slots 77 at their opposite ends which register with pairs of the radius arms 13 at the respective ends of the reel to clamp the latter securely. One end of the fixed end plate 73 is tapered at 78 and by engaging this end with the radius arm adjacent to the inner end of the spiral, the clip 15 will be correctly positioned relative to the plate 47 when the notch 51 is engaged by the pawl 50.

By altering the positions of the fixed end plate 73 and the threaded section 74 a similar assembly adapted to accommodate a reel of different width may be provided, as in the case of FIG. 7. The assembly enables the reel to be quickly and easily mounted on the apparatus in the correct angular and lateral position relative to the deflector plate 47, but could be used to clamp such reels for other purposes. The clamping assembly is therefore capable of use independently of the apparatus of the invention.

Various modifications may be made without departing from the invention. For example in some circumstances it may be desirable to render certain parts adjustable. Thus the pedestal 20 may be height adjustable or movable to and from the reel, and the guide plate 47 could be moved bodily towards and away from the reel instead of pivoting about the shaft 44. It may also be desirable to modify the shape of the plate 47 in some circumstances. Moreover the invention is applicable to winding of reels having solid ends formed with helical grooves instead of the slotted form referred to, and could also be applied to the winding of other materials in strip form on to similar reels.

In a further modification the device may be secured to the upper surface of a light-proof box having a drop-down front and adapted to accommodate loaded reels prior to transfer to a developing tank. A low-voltage lighting unit of appropriate colour may be mounted on the box and controlled by a switch operated by the box front so that the light is switched off when the box is opened. A rack may be provided on top of the box to store empty reels mounted on spindles ready for use. A drawer may also be incorporated to receive the spindle assemblies after dismantling and removal of the loaded reels.

I claim:

1. Apparatus for use in winding strip material on to a reel the ends of which are provided with spiral slots or grooves and are spaced apart by a distance slightly less than the width of the strip, the apparatus comprising means for supporting the reel, means for supporting the strip material in a delivery position, means for curving the strip material to reduce its width to less than the spacing of the ends of the reel, means for guiding the free end of the strip material into register with retaining means at the centre of the reel, means for flattening the strip material just prior to engagement with said retaining means, and means for rotating the reel to wind the strip material on to it with the edges of the strip material engaged in said slots or grooves and the coils of the strip material spaced from one another.

2. Apparatus according to claim 1 including a carrier on which a spool of the strip material may be rotatably mounted prior to its being wound on to the reel.

3. Apparatus according to claim 2 wherein said carrier is movable between a substantially upright loading position and a lowered winding position thereby alter-

ing the angle of presentation of the strip material and the distance from the carrier to the reel.

4. Apparatus according to claim 3 wherein said means for curving said strip material comprises a plate curved to the desired extent and having inturned edges engageable with the edges of the strip material and effective to cause the strip material to bulge into contact with the curved under-surface of the plate.

5. Apparatus according to claim 4 wherein said plate is pivotally and removably mounted on a pedestal member located between said spool carrier and said means for supporting the reel.

6. Apparatus according to claim 1 wherein said means for guiding the free end of the strip material and said means for flattening the strip material comprises a deflector plate movable from an inoperative position clear of the ends of the reel to an operative position in which it is located between said ends and close to the centre of the reel, the deflector plate including strip supporting surfaces disposed adjacent the respective ends of the reel.

7. Apparatus according to claim 6 wherein said deflector plate is removably mounted on a support arm angularly movable between said positions.

8. Apparatus according to claim 1 wherein locking means is provided to lock said reel in a predetermined loading position in which said retaining means is correctly presented to the advancing strip material.

9. Apparatus according to claim 8 wherein said reel is detachably mounted on a spindle assembly including a collar mounted on a spindle and provided with notch means engageable by a locking pawl forming part of said locking means.

10. Apparatus according to claim 6 wherein said reel is detachably mounted on a spindle assembly including a collar mounted on a spindle and provided with notch means engageable by a locking pawl forming part of said locking means, said locking pawl being mounted for movement in unison with said deflector plate to lock said reel against movement when said plate is in said operative position and release said reel for rotation when said plate is in said inoperative position.

11. Apparatus according to claim 10 wherein said carrier is movable between a substantially upright loading position and a lowered winding position thereby altering the angle of presentation of the strip material and the distance from the carrier to the reel, said lock-

ing member and said deflector plate being coupled to said carrier for movement in unison therewith to simultaneously move said carrier to its loading position and said deflector plate to its operative position and vice-versa.

12. Apparatus according to claim 9 wherein said spindle assembly comprises a central spindle to one end region of which a hand wheel and a fixed end plate are secured and the other end region of which has a threaded portion and a detachable end plate and nut member, the fixed end plate and the threaded portion being spaced apart by a distance corresponding approximately to the distance between the ends of the reel.

13. Apparatus according to claim 12 including spaced collar members mounted on said one end region of said spindle and engageable with said means for supporting the reel to locate the spindle assembly against movement in the direction of the spindle axis.

14. Apparatus according to claim 13 wherein said end plates are provided with slots engageable with radial rib members on the reel to locate the reel in a predetermined angular position relative to the spindle assembly.

15. A spindle assembly for mounting a reel having ends formed from spirally wound wire with the spirals spaced apart and held in position by radius arms on the outer faces of the respective ends, the assembly including a central spindle adapted to pass through the centre of the reel and to one end region of which a hand wheel and a fixed end plate are secured, the other end region having a threaded portion and a detachable end plate and lock nut, the threaded portion being spaced from the fixed end plate by a distance approximately equal to the distance between the ends of the reel, and said end plates having radially directed portions provided with slots engageable with said radius arms whereby to locate the reel in a predetermined angular position relative to the spindle assembly.

16. Apparatus according to claim 1 wherein said means for supporting said strip material in a delivery position, said means for curving the strip material, said means for guiding and flattening the strip material and said reel, may be detached and replaced by alternative similar components to accommodate strip material of a different width. from having

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