

[72] Inventors **Gunnar Wennerberg**
1641 Poppy Way;
Paul Westin, 1523 Daphne Drive, both of
San Jose, Calif.
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[54] **UNIVERSAL TAPE WINDER**
3 Claims, 15 Drawing Figs.

Primary Examiner—Stanley N. Gilreath
Assistant Examiner—Werner H. Schroeder
Attorney—Alan H. MacPherson

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242/67.3, 242/74.2
 [51] Int. Cl..... **B65h 17/06,**
B65h 75/28
 [50] Field of Search..... **242/55, 60,**
67.1, 67.2, 67.3, 67.4, 68, 73, 74, 74.1, 74.2, 116,
125.1

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ABSTRACT: A device for winding tapes contains a plurality of spindles protruding from one face of the device housing. The end of a tape to be wound or rewound is drawn around one or more of the spindles and attached to another of the spindles. Rotating a handle protruding from the device housing rotates the spindle to which the tape is attached, thereby winding the tape on this spindle.

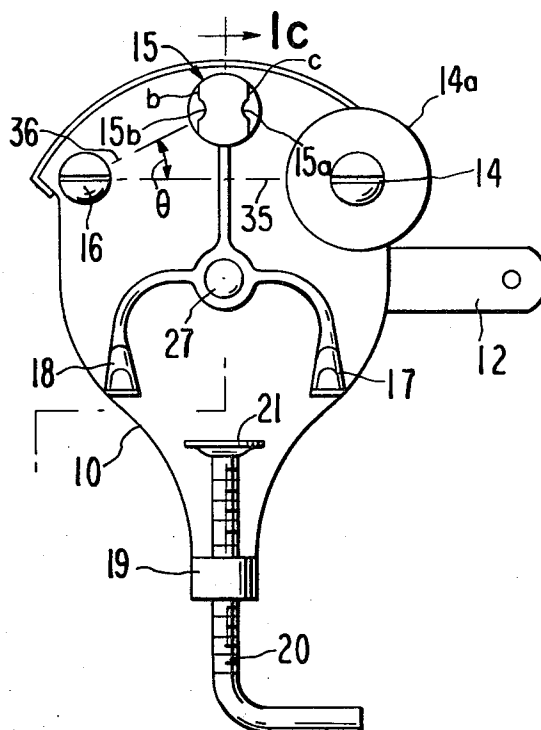


FIG. 1a

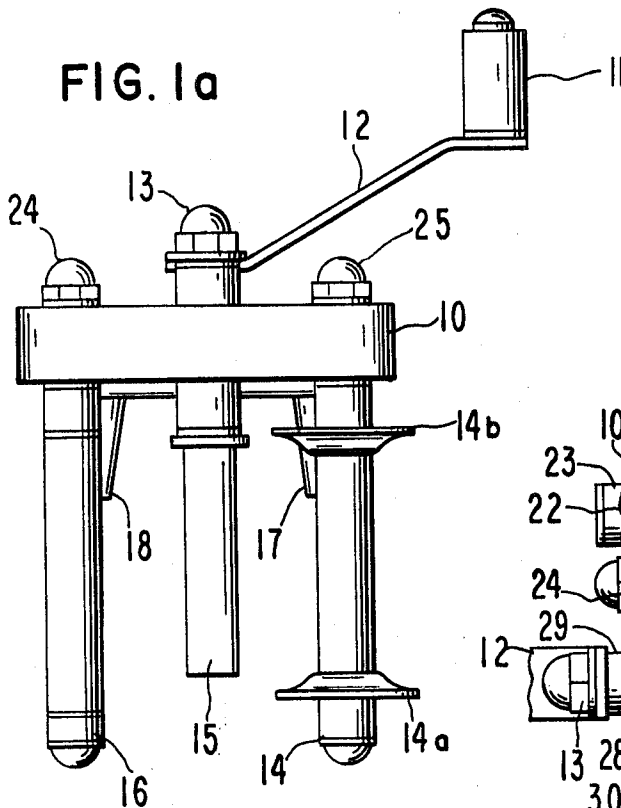


FIG. 1c

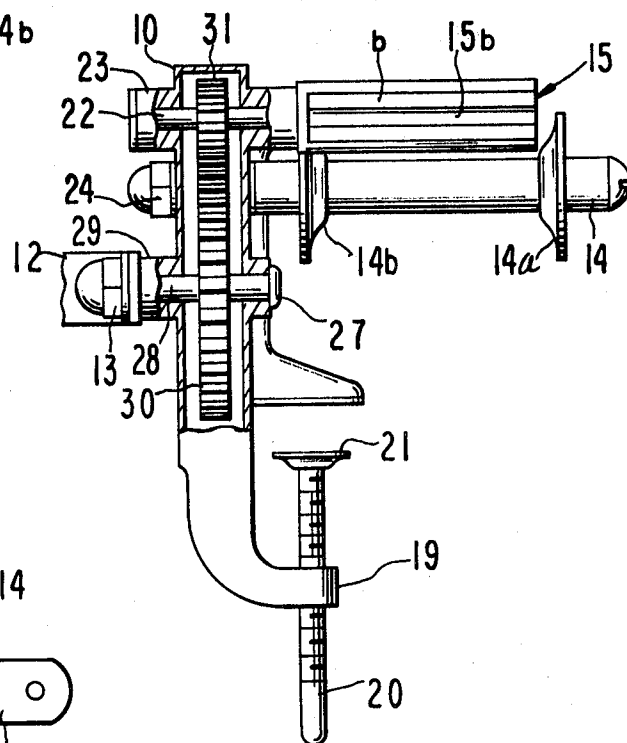
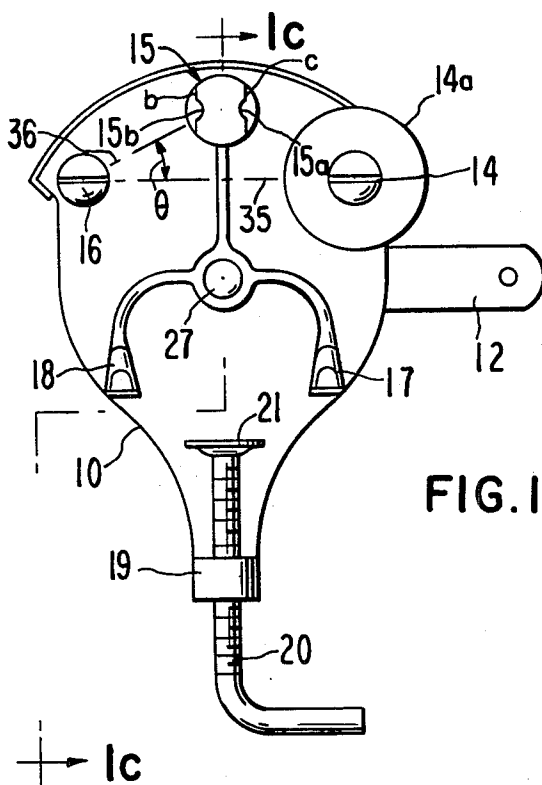


FIG. 1b



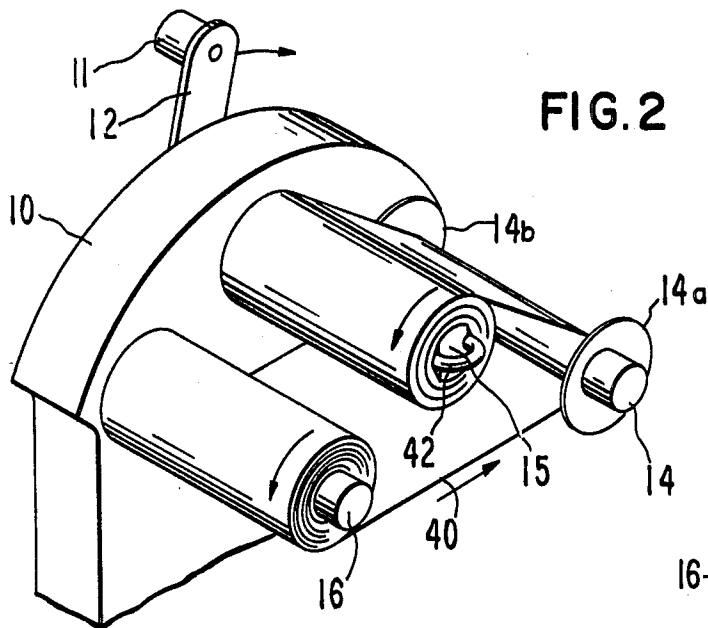


FIG. 2

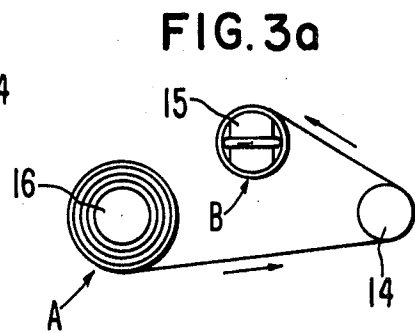


FIG. 3a

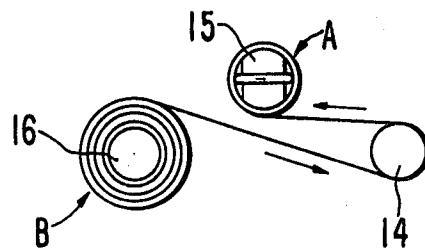


FIG. 3b

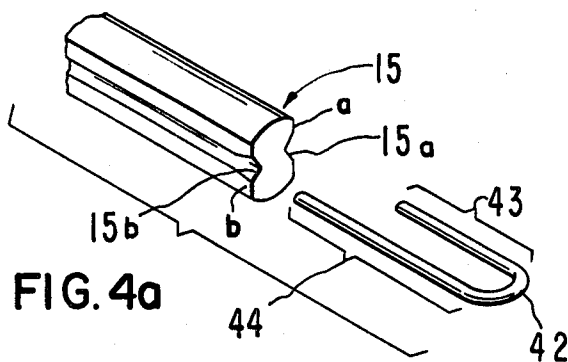


FIG. 4a

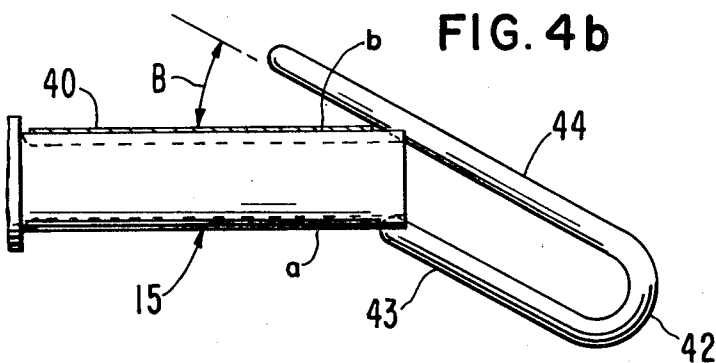


FIG. 4b

INVENTORS
GUNNAR WENNERBERG
PAUL V. WESTIN
BY *Alan H. Mackerson*
ATTORNEY

FIG. 4c

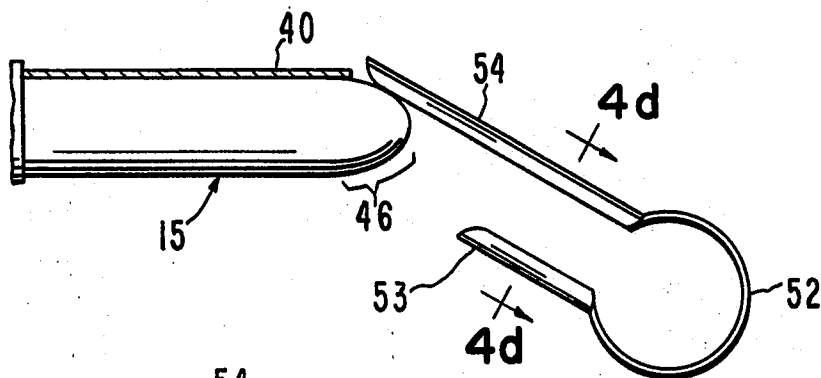


FIG. 4d

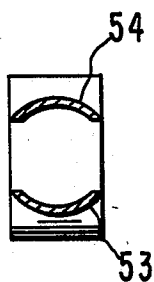


FIG. 4e

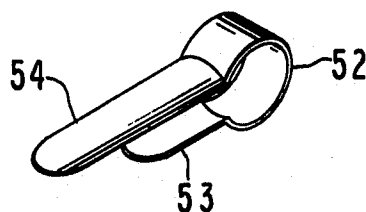


FIG. 5a

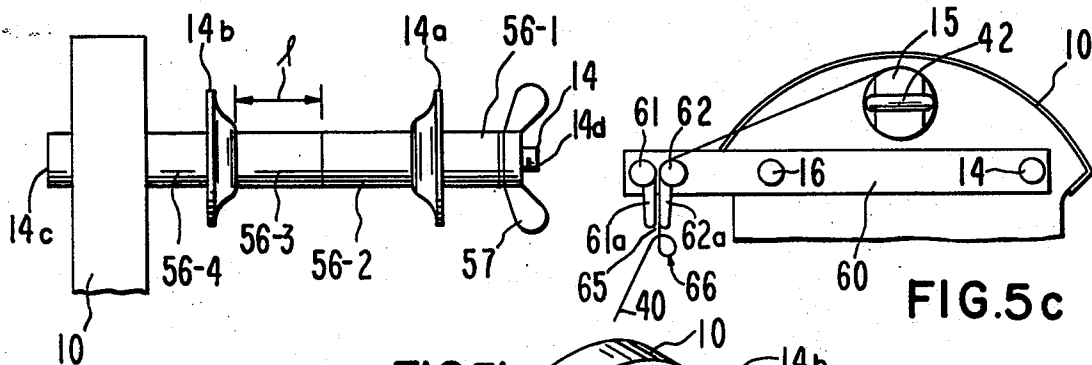


FIG. 5c

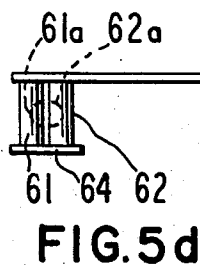
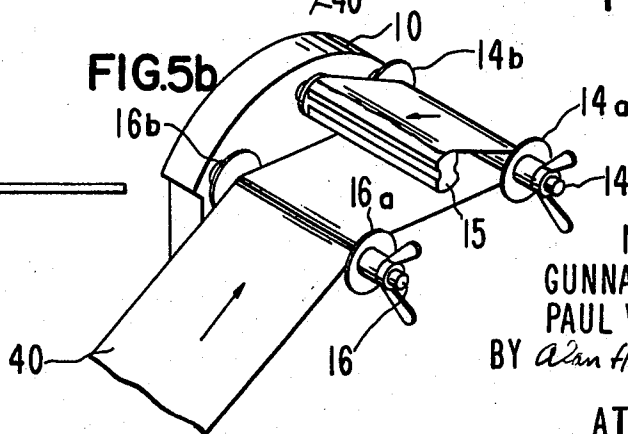


FIG. 5d

FIG. 5b



INVENTORS
GUNNAR WENNERBERG
PAUL V. WESTIN
BY *Alan H. MacKerson*
ATTORNEY

UNIVERSAL TAPE WINDER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to business machines and in particular to a machine for greatly simplifying the checking of a wide variety of tapes.

2. Background of the Invention

Retailers commonly use cash registers to record all sales. The clerk enters the sale price of each item sold into the register by pressing selected keys on the register. The amount of the sale is recorded on a paper tape, the so called "detail tape," contained within the register. At the end of the day, the store manager commonly removes the tape from the register. If the total dollar value of the sales shown on the tape differs from the increase in cash in the register during the day, he checks the detail tape to determine if the difference is due to employee error or dishonesty.

These detail tapes are rather difficult to work with, being many feet long and containing many numbers. Typically, the manager works through these tapes by hand, unwinding the tape in one hand and allowing the tape to cascade across the table or floor of the office while checking it. To rewind the tape he commonly winds the tape either around a finger or on a pencil. Clearly, the checking of detail tapes is a tedious time-consuming task.

SUMMARY OF THE INVENTION

This invention overcomes the prior art difficulties and provides structure which greatly simplifies the checking of detail tapes. The structure of this invention allows detail tapes to be checked easily and then to be recoiled neatly in a very short time, typically on the order of several seconds at most. Because the structure is hand operated, the person checking the detail tape maintains complete control over the checking operation.

According to this invention, a device for assisting in checking or winding tapes contains a plurality of spindles protruding from a housing. One spindle holds the tape to be checked and a second spindle holds the already checked portions of the tape as the tape is drawn off the first spindle and checked. The second spindle is drivably connected, through a transmission, to a rotatable handle on the opposite side of the housing.

In one embodiment, the tape is looped around a third spindle protruding from the housing, before being rewound on the second spindle.

To operate the device, a tape to be checked is placed on the first spindle. The tape is passed around the third spindle and rewound on the second spindle. The operator rotates the handle on the opposite side of the housing from the spindles, thereby turning the second spindle on which the tape is to be wound. The tape is wound at the rate desired. As the tape is wound, the operator examines the tape. To pass by uninteresting regions of the tape, the operator can speed the winding of the tape by turning the handle faster. When the operator comes to an interesting portion of the tape, the operator can wind the tape slowly and peruse each number on the tape. When the tape has been completely wound, the operator removes the tape from the second spindle and replaces the tape on the first spindle. Drawing the loose end of the tape around the third spindle and attaching this loose end to the second spindle allows the operator then to rewind rapidly the tape by turning the handle in the opposite direction from which the handle was turned to examine the tape.

The gearing ratio between the handle and the winding spindle is selected to ensure that the winding spindle makes many complete revolutions for one revolution of the handle. This ensures that a long tape, such as a typical NCR cash register detail tape, can be rewound completely in less than 10 or so seconds. This is a significant improvement over the several minutes formerly taken for this rewinding.

The structure of this invention can also be used to wind tape which has been allowed to lie randomly in bins.

Moreover, the structure of this invention, although developed to assist in checking and rewinding cash register detail tapes, has been found useful in checking and/or rewinding a wide variety of wound or coiled products, ranging from punched paper tapes and adding machine rolls to films, rolls of theater tickets and stamps. Variable spacers on the spindles allow quick conversion of the invented structure from one tape width to a second tape width.

This invention will be more fully understood in conjunction with the following detailed description taken together with the drawings.

DETAILED DESCRIPTION OF THE DRAWING

FIGS. 1a through 1c show top, front and side views of the tape-winding mechanism of this invention;

FIG. 2 shows an isometric view of the tape-winding mechanism of this invention;

FIGS. 3a and 3b illustrate the manner in which the tape is placed on the spindles to first check the numbers on the tape, and then to rewind the tape;

FIGS. 4a to 4e show two ways a tape can be attached to a spindle; and

FIGS. 5a, 5b, 5c and 5d show one way of adapting the tape winder to tapes of different widths and structure for removing loops, bends, twists and coils from the tape as it is wound.

DETAILED DESCRIPTION

As shown in FIG. 1a, the structure of this invention is built around housing 10. Protruding perpendicularly from one surface of housing 10 are spindles 14, 15, and 16. As shown in FIG. 1b, spindles 14 and 16 are aligned along the same horizontal line across housing 10. Spindle 15 is placed approximately half way between spindles 14 and 16 and somewhat above these two spindles, such that line 35 between spindles 14 and 16 make an angle of about 45° with line 36 between spindles 14 and 16. This particular angle is not critical. Typically, spindles 14 and 16 are spaced about 3 inches apart, while spindle 15 is about 1½ to 2 inches from both spindles 14 and 15. These dimensions, of course, can vary depending upon the tape size to be wound, and the diameters of spindles 14, 16, and 15.

Contained within housing 10 are gears 30 and 31, shown in cross-sectional view in FIG. 1c. Gear 30 is held within housing 10 by shaft 28 to which gear 30 is rigidly attached. Shaft 28 rotates on bearing surfaces provided within housing 10 by housing protrusions 27 and 29. Rigidly attached to shaft 28 is handle 12 to which is attached gripping knob 11. By rotating handle 12, gear 30 is rotated within housing 10. Gear 31, driven by gear 30, is mounted in housing 10 on shaft 22. Shaft 22 rotates on bearing surfaces provided in housing 10 by housing protrusion 23 and by the edge of the hole in the housing through which this shaft protrudes. Attached to the extension of shaft 22 external to the housing is spindle 15. Thus, rotation of handle 12 ultimately rotates spindle 15. The gear sizes are selected so that gear 31 makes many revolutions for one revolution of gear 30. The precise gear ratio is determined by the mechanical advantage desired. In one embodiment of this invention gear 30 has a diameter of about 4 inches, while gear 31 has a diameter of about one-half inch, to yield eight revolutions of gear 31 for each revolution of gear 30. The relative sizes of gears 30 and 31 are determined by the speed with which it is desired to wind tape on spindle 15.

An extension 19 of housing 10 bends to occupy a plane perpendicular to the plane of the two parallel faces of housing 10. Mounted on extension 19 is threaded screw 20. By rotating screw 20, on the top end of which is mounted pad 21, housing 10 can be mounted on a table edge or any other suitable protrusion. Rotating screw 20 brings pad 21 into contact with the bottom surface of the edge, while feet 17 and 18, mounted on housing 10, are drawn against the top surface of the edge. This rigidly attaches housing 10 to the desired edge.

To operate the structure of this invention, a roll of tape 40, such as detail tape, is mounted on spindle 16 as shown in FIG. 2. If an NCR detail tape, the printed record of the day's sales is facing outward on the tape. The operator draws the leading edge of tape 40 beneath and up over spindle 14 as shown and attaches this tape end to spindle 15 by means of a clip to be described later. The operator then rotates handle 12 in the clockwise direction as shown. This causes spindle 15 to rotate in the counterclockwise direction, winding tape from spindle 16 around spindle 14 and onto spindle 15 as shown. By varying the speed with which handle 12 is rotated, the speed with which the tape is wound on spindle 15 is likewise varied. Because the printing on the tape is on the outside of the tape, the operator can view this printing while winding the tape on spindle 15.

When the complete tape has been reviewed and wound on spindle 15, the operator then removes the tape from spindle 15 and places this tape, labeled B in FIGS. 3a and 3b, on spindle 16 as shown in FIG. 3d. While the tape, prior to checking, was mounted on spindle 16 such that the loose end was taken off the bottom of the tape, after the tape A has been rewound on spindle 15 to form rewound tape B, shown in FIG. 3a, the original loose end is now on the inside of the roll. Thus, when tape B is replaced on spindle 16, the new loose end of tape B is taken off the top of the tape, wound partially around spindle 14, as shown in FIG. 3b, and then wound underneath and up over spindle 15, as shown in FIG. 3b. Thus, when the tape has been rewound onto spindle 15, it is in precisely the condition it was prior to examination. Such a tape can easily be reexamined, if necessary.

The speed of the rewinding is controlled only by the maximum rate at which the operator can turn the handle 12 (FIG. 2). Rotating this handle in the counterclockwise direction rotates spindle 15 in the clockwise direction. Because of the gear ratio of the transmission between handle 12 and spindle 15, tape 40 is rewound very rapidly on spindle 15. Throughout the checking of the tape and during the rewinding of the tape, disc-shaped stops 14a and 14b, shown in FIGS. 1a, 1b, and 1c, as well as in FIG. 2, prevent tape 40 from wandering along spindle 14, either toward or away from housing 10. These stops ensure that the rapid rewinding of the tape after it has been checked produces a compact, neat tape roll, the edges of which are smooth and flat.

To hold the tape on spindle 15, a special clip 42 as shown in FIGS. 4a and 4b has been developed. This clip, basically U-shaped, contains two legs 43 and 44, leg 43 being significantly shorter than leg 44. Each leg fits into a corresponding groove 15a and 15b, in the sides of faces a and b of spindle 15. To secure one end of a detail tape on spindle 15, the end is drawn over one flat face, face b, shown in FIG. 4b, of spindle 15. Then clip 42 extends upward making a selected angle with the plane of paper 40. Thus, the end of leg 44 does not push against the outside edge of paper 40 but rather comes down on top of paper 40, thereby preventing tearing, ripping, or bending of the edge of paper 40. Then clip 42 is slid along grooves 15a and 15b, forcing the paper between leg 44 of the clip and groove 15b on face b of spindle 15. This securely locks paper 40 to spindle 15.

FIG. 4c shows an alternative clip for locking paper to spindle 15. This clip considerably simplifies the shape of spindle 15. Rather than having two opposing flat faces a and b as shown in FIG. 4a, spindle 15 can be perfectly round, with however, a tapered, rounded end 46. As shown in FIGS. 4c, 4d, and 4e, clip 52 then is designed to fit over pin 15. Clip 52 likewise has two legs, one leg 54 being longer than the other leg 53. The end of paper 40 is drawn over spindle 15. Then clip 52 is angularly slid onto spindle 15. As clip 52 is tilted so that both legs slidably contact the surface of spindle 15, any paper between long leg 54 and spindle 15 is securely clamped between leg 54 and spindle 15. Legs 53 and 54 each have a curved cross section as shown in FIG. 4d, an end view. FIG. 4e shows an isometric view of pin 52.

While so far spindle 15 has been shown as having approximately the same diameter as spindles 14 and 16, an alternative

embodiment of this invention uses a spindle 15 with a diameter many times that of either spindle 14 or spindle 16. This large diameter spindle results in a tape roll with a large center section unoccupied by paper. This tape roll can then be flattened and shipped to central accounting offices in flat parcels or boxes.

An additional feature allows the rapid conversion of the tape winder of this invention to handle tapes of differing widths. As shown in FIG. 5a, selected spindles on housing 10 exemplified by spindle 14, use variable spacers 56-1 through 56-4 to separate discs 14a and 14b. Each spacer shown in FIG. 5a has a length L, although for greater flexibility in spacing discs 14a and 14b, spacers of unequal length can also be used. While only four spacers are shown on spindle 14 in FIG. 5a, a lesser or greater number of spacers can be used to achieve different spacings between discs 14a and 14b as well as a larger number of possible spacings between these two discs. Each spacer 56 is of tubular construction so as to readily slide over spindle 14. Spindle 14 is shown in FIG. 5a as a threaded rod inserted through housing 10. Head 14c of spindle 14 prevents the spindle from coming completely through the head while end 14d of the spindle is threaded. A wingnut 57 then screws on to threaded end 14d of spindle 14 to thereby hold spacers 56 together and thus hold discs 14a and 14b in their proper location.

As shown in FIG. 5a, discs 14a and 14b are separated by width 2L and thus spindle 14 can wind a tape of width 2L. To change spindle 14 to handle a tape of width L, wingnut 57 is removed from the spindle, and spacers 56-1 and 56-2 together with disc 14a are slid off the spindle. Then disc 14a is reinserted over the spindle and spacers 56-1 and 56-2 are replaced back onto the spindle and firmly held there by wingnut 57. Disc 14a now rests between spacers 56-2 and 56-3 rather than between spacers 56-1 and 56-2.

Spindle 16 (FIG. 5b) can likewise be changed so that the spacing discs 16-a and 16-b (FIG. 5b) if any, are likewise similarly relocated.

FIG. 5b shows one embodiment of this invention suitable for coiling tape randomly stored in a bin or some other location. The tape is drawn from the storage unit over spindle 16 and then wound under and around spindle 14 and attached to spindle 15 in the manner described above. The tape then is wound rapidly onto spindle 15. Spacing discs 14a, 14b, 16a, and 16b assist in properly aligning the edges of the tape before the tape is wound on spindle 15.

An additional embodiment of this invention is useful in winding into rolls tape which has been stored in bins or allowed to cascade randomly. As shown in FIGS. 5c and 5d, side and top views respectively of this embodiment, arm 60 is attached to, but spaced from housing 10 by spindles 14 and 16. At one end of arm 60 rolls 61 and 62 are placed side by side, separated by slightly more than the thickness of the tape to be wound. Protrusions 61a and 62a extend perpendicularly from rolls 61 and 62 respectively. Although these protrusions are shown extending vertically downward in FIGS. 5c and 5d, these protrusions can be rotated to extend in any other direction desired. A gap 65, slightly wider than the tape is thick, is left between these protrusions. The tape to be wound is threaded through gap 65 between the protrusions and between rolls 61 and 62 and then clamped onto spindle 15 by pin 42. The tape is then wound onto spindle 15. Any loops in the tape such as loop 66 are straightened by protrusions 61a and 62a. If desired, the tape can first be wound around spindle 14 containing spacing discs 14a and 14b (not shown) before being attached to spindle 15.

The speed with which tape 40 can be wound is determined by the number of loops per unit length in the tape. The greater the loop density and the tighter the loops, the slower the tape must be wound. When the loops are fairly loose, occurring only every few feet, the tape can be wound at a speed on the order of 10 feet per second. However, the exact speed with which the tape can be wound depends upon the tape material and the skill of the operator.

We claim:

1. Structure which comprises
a housing containing a selected transmission;
a handle rigidly attached through said housing to said trans-
mission for driving said transmission;
three spindles mounted on, and protruding in parallel from, 5
a selected face of said housing;
means for attaching an end of a tape to a selected one of
said spindles, said selected one of said spindles being
rigidly attached through said housing to said transmission
so as to be driven through said transmission by the rota- 10
tion of said handle, thereby to wind said tape onto the
selected one of said spindles;
two disc-shaped stops mounted on a third one of said spin-
dles for preventing movement toward or from said hous- 15
ing of the tape being wound onto said selected one of said
spindles; and
a plurality of tubular spacers held onto said third one of said
spindles by a locking means, said disc-shaped stops being 20
separated from each other by a selected number of said
plurality of spacers.

2. Structure which comprises:
a housing containing a selected transmission;
a handle rigidly attached through said housing to said trans-

mission for driving said transmission;
three spindles mounted on, and protruding from, a selected
face of said housing;
clip means for attaching an end of a tape to a selected one of
said spindles, said selected one of said spindles being
rigidly attached through said housing to said transmission
so as to be driven through said transmission by the rota-
tion of said handle, thereby to wind said tape onto said
selected one of said spindles, said clip means being U-
shaped and containing two legs, one leg being longer than
the other leg, said selected one of said spindles containing
two flattened, opposed faces on opposite sides of said
spindle, each flat face containing a groove for slidably
receiving a selected one of said two legs of said clip.

3. A clip for securely fastening a flat material to a cylindri-
cal spindle having a tapered end, said clip comprising:
two parallel legs, one of said legs being shorter than the
other leg, and each leg possessing a curved cross section
such that the inner surface of each leg is concave to mate
and slidably contact a portion of the curved surface of
said cylindrical spindle, the concave inner surfaces of said
two legs facing each other.

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