May 7, 1968 J. E. HAWES 3,381,789

SELECTIVE TAPE PRINTER

Filed Dec. 9, 1965

FIG. 1

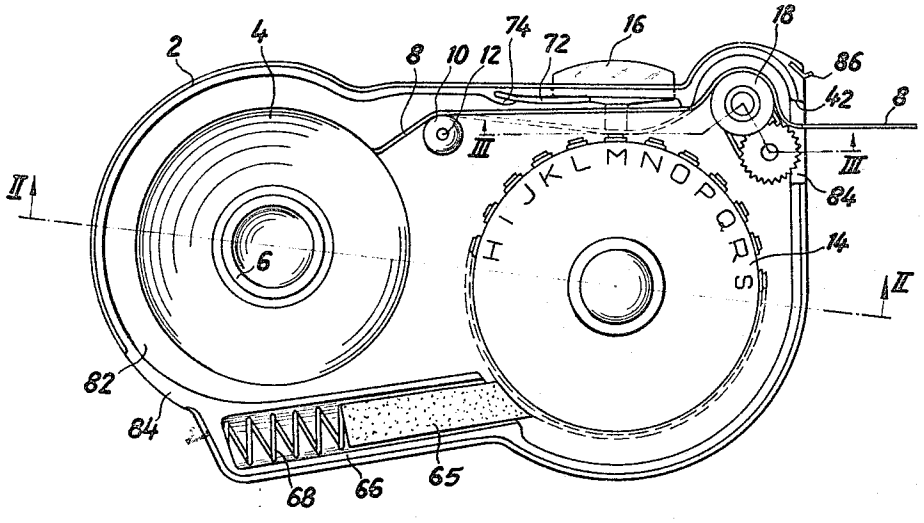


FIG. 2

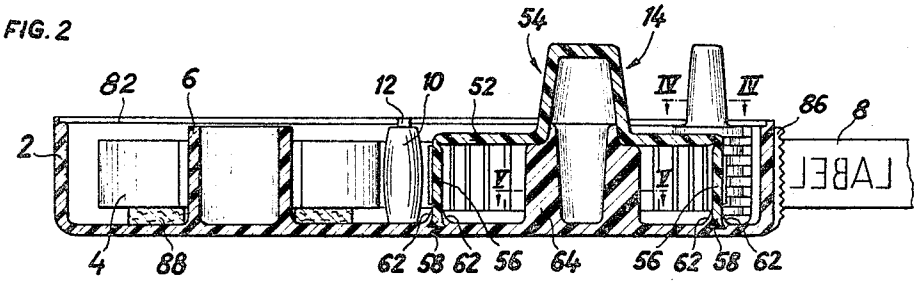


FIG. 4

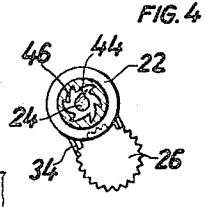


FIG. 3

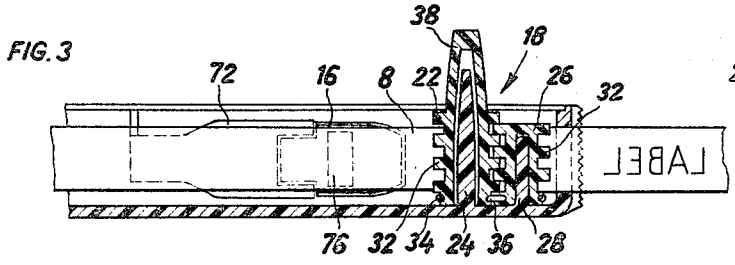
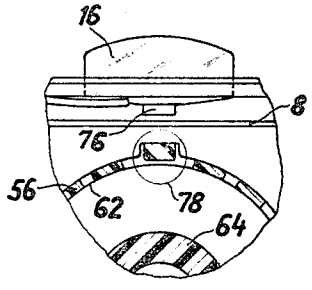


FIG. 5



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SELECTIVE TAPE PRINTER

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This invention relates to printing cellophane tape, and more particularly to a device for printing any desired legend on a length of cellophane tape.

The term "cellophane tape" is used to describe, in general, a transparent or translucent strip, normally formed of a non-porous plastic material such as cellophane, and which has a pressure sensitive adhesive coating on at least one surface.

Printing paper or cloth is relatively easy, for they are both porous substances and ordinary inks will flow into their microscopic pores and print them quite well. Printing a relatively non-porous substance though, like cellophane, is much more difficult, for ordinary inks will not adhere and form a lasting image on such substances. Special inks have been developed to print non-porous materials, yet because of their special nature these inks require special printing machines and techniques. These specialized requirements greatly multiply the cost of printing cellophane tape, even in large quantities. Accordingly, printed cellophane tape is not used very much, even though the potential market for it is great.

Recently devices which emboss a special type of tape with any desired legend, thereby forming a label, have come into common use. However, the special embossing tapes required by such devices are expensive; for aesthetic reasons the tapes should be changed to match or blend their color with the color of the receiving surface; and the embossed legend may be erased simply by pressing the raised lettering forming the legend back into the body of the tape. These major disadvantages limit the usefulness of such embossing devices.

This invention provides a device for printing ordinary cellophane tape with characters in any desired order, to form a label, yet without resorting to special inks and complicated machines. Rather, the invention employs ordinary materials in a unique device to print different legends as desired on lengths of cellophane tape. This result is particularly remarkable in view of previous efforts both to print cellophane tape, and to design label-making devices. It proceeds from a simple concept—the cellophane tape is printed not on the cellophane surface, which would require special inks, but rather on the adhesive surface of the tape with a dry, adhering pigment. Because the cellophane tape is transparent or translucent, the pigment sticking to and carried by the adhesive on the underside of the tape shows through the tape; the legend printed on the adhesive is visible against the background material to which the printed cellophane tape label is applied, and the cellophane tape itself covers and protects the printing from distortion and obliteration. Many other advantages accrue from printing the adhesive surface of the cellophane tape.

To print the cellophane tape, a coating of pigment is applied about characters offset from a printing die, and thereafter the adhesive surface of successive areas along a length of cellophane tape are brought into contact with selected characters of the printing die, the adhesive picking up the pigment coating on these characters and forming along the tape a legend composed of the selected characters. Preferably the printing die is constructed as a cylinder with the characters extending about its circumference, and it is mounted to rotate first past a pigment stick which bears on and coats the passing characters with pigment, and then past the adhesive surface of the tape where it may be brought into contact with the tape as desired.

The invention will be further described in connection with the accompanying drawings, in which:

FIGURE 1 is a plan view of a tape printer embodying the invention and

FIGURES 2, 3, 4, and 5 are cross-sectional views of the tape printer taken on lines II,—II, III—III, IV—IV, and V—V respectively.

The elements of the tape printer shown in FIGURE 1 are housed in a case 2, preferably molded of plastic, and whose shape, size and weight make it comfortable to hold with one hand. A roll of cellophane tape 4 is mounted on, and rotates about, a spindle 6 fixed to the case. A length of cellophane tape 8 extends from the roll over a roller 10, which turns about a pin 12 fixed to the case, then between a character wheel 14 and a print bar 16, and to an advance mechanism 18, with the adhesive surface of the tape facing the character wheel and bearing on the advance mechanism.

The advance mechanism, most clearly shown in FIGURE 3, includes a drive roller 22, mounted for rotation about a pin 24 fixed to the case, and a kick-off roller 26 mounted for rotation about a pin 28 fixed to the case. Both rollers include a series of spaced circumferential bosses or rings 32 which contact the tape, the rings of the drive roller interleaving with the rings of the kick-off roller. A flexible resilient cord or band 34 is received in and extends between aligned grooves 36 in the bases of the rollers, so that as the drive roller is turned by turning its knob 38 projecting above the case, both rollers turn in the same direction. However, as the two rollers turn the kick-off roller turns somewhat faster than the drive roller because the diameter of the groove in the kick-off roller is somewhat less than the diameter of the groove in the drive roller.

The outer surface of the rings about the drive roller preferably should be smooth to enhance adhesion of the tape to them, and the outer surface of the rings about the kick-off roller preferably should be notched or serrated to limit adhesion of the tape to them. Accordingly, when the knob of the drive roller is turned, the section of cellophane tape adhering to the rings about the drive roller also turns, pulling tape from the supply roll. The resilient cord 34 drives the kick-off roller so that it turns somewhat faster than the drive roller and the notched outer surface of the rings about the kick-off roller slide past the adhesive surface of the tape, camming the tape from the rings of the drive roller and out of the case through an opening 42.

To control the advance of the tape by the advance mechanism, and to advance the tape in predetermined increments past the character wheel, a simple yet effective detent mechanism may be included as part of the advance mechanism, as shown in FIGURE 4. The detent mechanism is formed by an outstanding longitudinal shoulder or detent 44 formed on pin 24, and

cooperating longitudinal recesses or teeth **46** about the axial cavity in the drive roller which receives the pin. The shoulder **44** on the pin is positioned generally to face away from the kick-off roller, as shown, so that the resilient cord **34** holds the teeth within the drive roller against the shoulder on the pin and forces the teeth to ride, or ratchet, over the shoulder against the biasing force of the resilient cord as the drive roller is turned. Preferably rotation of the drive roller is limited to one direction by appropriately shaping the cooperating shoulder and teeth with a radial side, generally as shown. By this structure then, the cellophane tape may be advanced through the case in discrete and equal increments, and only in a forward direction.

The character wheel **14**, as shown in FIGURE 2, includes a flat disc-shaped body **52** bearing an upstanding central knob **54**. A series of generally rectangular shaped character tabs **56** are formed about the periphery of the disc, and each character tab carries a raised, outwardly projecting, character. The character wheel may be molded of a plastic such as "Delrin" with the character tabs **56** lying generally in the same plane as the disc **52**. During the assembly of the tape printer, the character tabs **56** are all bent down to define a generally cylindrical surface about the periphery of the disc **52**. Each character tab includes at its outer end a boss or knob **58** which during assembly is shoved into a channel defined by closely spaced opposed walls or lips **62** formed in the base of the case. A spindle **64** is fixed to the base of the case and extends upwardly into the hollow knob of the character wheel to position and reinforce it against lateral forces. The character wheel may be rotated, bosses **58** slipping through the channel defined by lips **62**, by turning knob **54**.

The character tabs, as the character wheel is turned, pass a pigment stick **65** which is received in a slot **66** defined by walls of the case and which is biased into engagement with the character wheel by a spring **68**. As the character tabs pass the pigment stick, the face of each character projecting from the character tabs rubs across the pigment stick and receives a surface coating of dry pigment. As the character wheel continues to turn, the character tabs pass by the adhesive surface of the strip of cellophane tape extending between the roller **10** and the advance mechanism **18**. The strip of cellophane tape may be cammed into engagement with any selected character on the character wheel by pressing the print bar **16**, received in a slot formed in the wall of case **2**. To resist the pressure of the print bar against the character tab, the lip **62** behind the character tab may be enlarged.

The print bar is biased away from the cellophane tape by a leaf spring **72**, one end of which is received in a slot **74** formed in a wall of the case, the other end of which is bifurcated and extends about a recess formed in one end of the print bar **16**. The print bar includes a knob **76** projecting towards the tape and character wheel. When the print bar is depressed, knob **76** presses the adjacent section of cellophane tape into engagement with the aligned character tab, causing the adhesive on the surface of the tape to pick up the dry pigment coating on the surface of the character formed on that tab, thereby printing the tape with this character. The advance mechanism then may be rotated one step, determined by the detent mechanism, to advance the just printed adhesive surface of the cellophane tape past knob **76** and to position a fresh section of tape adjacent the knob and in position to be printed.

The character wheel preferably includes a ratchet mechanism, shown most clearly in FIGURE 5, to insure alignment of a selected character with the boss **76** on the print bar. This ratchet mechanism preferably is formed by distorting the circular nature of the channel defined by lips **62** in an area **78** the width of one tab, so that as the character tabs **56** pass this distorted area they snap into it, tab by tab. In this manner the distorted area of the channel controls the position of the character wheel and provides a ratchet action. The distorted area advantageously may

face knob **76** on the print bar, as shown, so that the tabs snap outwardly into the distorted area and towards the print bar. Then, during printing of the cellophane tape, the print bar will press against the character tab in this distorted area, camming it back into alignment with the adjacent character tabs. During rotation of the advance mechanism after a character has been printed the adhesive tape occasionally may tend to stick to the character tab just used to print the tape, and tend to rotate the character wheel in synchronism with the advance of the cellophane tape. The outward distortion of the portion of the channel opposite the print bar will oppose this tendency and prevent rotation of the character wheel, because the tape will tend to pull any character tab to which it may adhere deeper into this outward distortion thereby locking the character wheel in position.

A clear cover **82** is received in a step formed at the outer edge of the case **2**, and locked to the case by tabs **84**. A cut-off bar **86** is received in a slot formed in the outer surface of the case adjacent the opening **42** through which the printed tape is ejected. After the desired legend has been printed on the cellophane tape by rotating the character wheel **14** to align selected characters with successive segments of the cellophane tape, and camming the adhesive surface of the cellophane tape against the selected characters by pressing the print bar, the printed length of the cellophane tape may be advanced to a position outside of the case by turning the drive roller **22** of the advance mechanism. Then the printed segment of cellophane tape may be severed from the remaining length of tape by pulling the segment upwardly and against the cut-off bar **86**, the teeth of the cut-off bar cutting the cellophane tape. In this manner a printed label bearing any desired legend may be formed.

Preferably the case is deep enough, and the mechanism wide enough, to accept rolls of tape up to ¾" wide. Should a narrower tape be used, a fiber washer **88** may be provided to align the roll and tape with the mechanism.

The tape printer will print any desired legend on labels which may be used to identify the contents of bins, file drawers, or the owner of the item to which it is attached, for example. Because the cellophane tape protects the printing between it and the supporting surface, regardless of how dirty the remainder of the surface might become, it will always be possible to read the legend simply by wiping the cellophane, and this can be a decided advantage in many applications. Also, because the cellophane tape protects the printing, the legend will retain its original intensity and form, and will not be rubbed off or distorted by normal wear and handling, which characteristic may be a requirement for some applications, such as automatic machine reading of printing. For security or other purposes, it may be desired to use an opaque tape to conceal the printing, which then may be read only by special machines sensitive to a characteristic of a printing pigment used, such as its magnetic or radioactive qualities.

In normal use, as a length of the tape is being drawn out for use, the adhesive surface of the cellophane tape is touched. Since the adhesive surface has been printed, this handling would seem to inevitably distort and smudge the label, and dirty one's fingers with pigment. In practice this is not necessarily the case though. Tests indicate that only as much pigment seems to adhere to the adhesive surface of the tape as it will securely hold, possibly because the adhesive must pick up or pull the pigment from the face of the character tab. As a result, normal handling of the printed side of the cellophane tape will neither distort the printing nor dirty one's fingers to any appreciable degree. While the pigment for all practical purposes destroys the adhesive character of the discrete area of the cellophane tape to which it adheres, with ordinary care in selecting the printed configuration, enough of the adhesive surface of the tape will remain free of pigment to hold the label securely to the surface to which it is applied.

Since this invention lends itself to the use of a dry pig-

ment in stick form, rather than requiring the special liquid highly volatile inks of previous tape printers, no appreciable problem is encountered from intermittent use of the tape printer. Even if the printer has not been used for days, it will still properly print the tape without recoating all of the characters. The portion of the raised character areas which had previously passed the pigment stick and received a coating of pigment, but which had not yet contacted the adhesive surface of the cellophane tape, would still retain the coating of pigment and deposit it on the adhesive surface of the tape, even though the printer may not have been used for prolonged periods and these character areas had not been rotated past the pigment stick immediately prior to the printing. However, when volatile carriers are used, as required by previous cellophane tape printers, evaporation of the carrier while the ink sets on the raised printing areas and in the reservoir may impair the quality of the subsequent printing and tend to gum up the printing device. For these reasons there is distinct advantage to using a dry pigment, as does the tape printer of this invention.

While specific embodiments of the invention have been shown and described, various modifications likely will occur to those familiar with the disclosed concepts. Accordingly the scope of the invention is defined not by the specific structure disclosed but by the following claims.

I claim:

1. A device for selectively printing the pressure-sensitive adhesive surface of a tape with any desired legend including a source of tape, a character wheel having a series of different characters generally equally spaced from an axis, means to guide a length of tape past and spaced from the characters on the character wheel with the adhesive surface of the tape facing the characters, means mounting the character wheel for rotation relative to the length of tape and generally about the axis defined by the characters, a source of pigment, means coating the surface of the characters with pigment from said source of pigment, and means to selectively cam the adhesive surface of a segment of tape and any desired character on the character wheel into contact whereby the adhesive surface of the tape picks up the coating of pigment on the selected character and the tape thereby may be printed with the characters in any desired order to form a legend.

2. A device for printing tape as set forth in claim **1** in which the surface defined by the characters on the character wheel is generally cylindrical.

3. A device for printing tape as set forth in claim **1** including advancing means to drive the tape from the source of tape past the characters on the character wheel.

4. A device for printing tape as set forth in claim **3** in which the advancing means pulls the tape from the source of tape past the characters on the character wheel and includes a drive roller and a kick-off roller, each roller having a series of axially spaced projecting circumferential discs, means mounting the rollers for rotation with the discs interleaved, means including a flexible band bearing on both the drive roller and the kick-off roller for rotating the kick-off roller in the same relative direction as, but faster than, the drive roller, and means guiding the adhesive surface of the tape into contact with the surface of the discs of the drive roller whereby rotation of the drive roller pulls the adhering tape with it and into contact with the discs on the kick-off roller which free the cellophane tape from the discs on the drive roller.

5. A device for printing tape as set forth in claim **4** in which the means mounting the drive roller for rotation includes a pin received in an axial channel in the drive roller, and including a detent mechanism comprising a longitudinal shoulder projecting from the pin mounting the drive roller for rotation, teeth formed on the interior surface portion of the drive roller defining its axial channel, the diametrical distance from the shoulder on the pin to the opposite side of the pin being less than the diametrical distance from the interior tip of the interior teeth of the drive roller to the interior tip of the opposed teeth, means including the band biasing the drive roller against the raised shoulder on the pin whereby rotation of the drive roller requires the interior teeth of the drive roller to ratchet over the shoulder on the pin.

6. A device for printing any desired legend on a length of cellophane tape including a case, means mounting the roll of cellophane tape within the case for rotation relative to the case, a character wheel having an axial knob and a series of different, raised characters about its periphery, the raised characters defining a generally cylindrical surface whose axis is the axis of the knob, means to guide a length of cellophane tape past and spaced from the characters on the character wheel with the adhesive surface of the cellophane tape facing the characters, means mounting the character wheel within the case for rotation generally about the axis of the cylindrical surface defined by the characters, a source of pigment, means within the case for receiving and biasing the source of pigment against the characters of the character wheel whereby the faces of the characters receive pigment, means for selectively camming the adhesive surface of any desired segment of cellophane tape and any desired character on the character wheel into contact whereby the adhesive of the cellophane tape picks up the pigment on the character and prints the cellophane tape, and advancing means to pull cellophane tape past the character wheel and between the characters on the character wheel and said means to cam the character into contact.

7. A device for printing cellophane tape as set forth in claim **6** in which the advancing means includes a drive roller and a kick-off roller, each roller having a series of axially spaced projecting circumferential discs, means mounting the rollers for rotation with the discs interleaved, means including a flexible band bearing on both the drive roller and the kick-off roller for rotating the kick-off roller in the same relative direction as, but faster than, the drive roller, and means guiding the adhesive surface of the tape into contact with the surface of the discs of the drive roller whereby rotation of the drive roller pulls the adhering tape with it and into contact with the discs on the kick-off roller which free the cellophane tape from the discs on the drive roller.

8. A device for printing cellophane tape as set forth in claim **7** in which the means mounting the drive roller for rotation includes a pin received in an axial channel in the drive roller, and including a detent mechanism comprising a longitudinal shoulder projecting from the pin mounting the drive roller for rotation, teeth formed on the interior surface portion of the drive roller defining its channel, the diametrical distance from the shoulder on the pin to the opposite side of the pin being less than the diametrical distance from the interior tip of one of the teeth on the interior surface of the drive roller to the interior tip of the opposed tooth, means including the band biasing the drive roller against the raised shoulder on the pin whereby rotation of the drive roller requires the interior teeth of the drive roller to ratchet over the shoulder on the pin.

9. A device for printing cellophane tape as set forth in claim **8** in which the case includes an opening through which the printed length of cellophane tape is ejected by the advancing means, and a cut-off bar attached to the case adjacent to the opening in the case through which the tape is ejected.

10. A device for printing cellophane tape as set forth in claim **6** in which the source of pigment is a pigment stick, the pigment stick rubbing past the characters successively as the character wheel rotates to coat the face of each character with a dry layer of pigment.

11. A device for printing cellophane tape as set forth in claim **6** including a generally circular channel formed by closely spaced opposed walls in the case, and in which

the character wheel includes a plurality of separate outwardly extending tabs, each tab including a raised character formed thereon, the outer ends of the tabs being contained in and slidable along the circular channel.

12. A device for printing cellophane tape as set forth in claim **11** in which the channel formed in the case includes a distorted area approximately the width of one tab through which the tabs must slide, the distorted area cooperating with the tabs to provide a ratcheting action as the character wheel is turned.

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