Aug. 11, 1959 D. M. GILLIES 2,898,849

ENGRAVING APPARATUS

Filed May 28, 1954 2 Sheets-Sheet 1

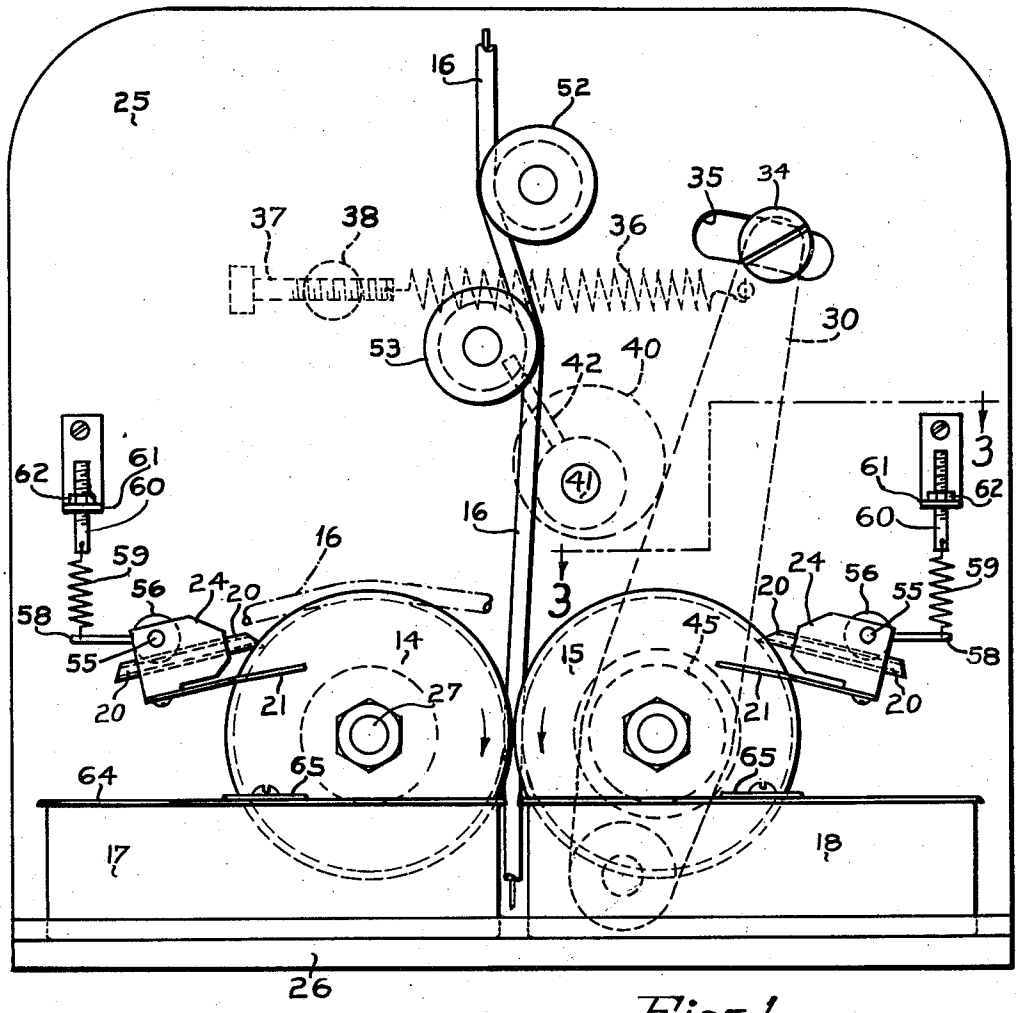


Fig. 1.

INVENTOR.
Duncan M. Gillies
BY
Clayton L. Jenks
ATTORNEY

Aug. 11, 1959 D. M. GILLIES 2,898,849

ENGRAVING APPARATUS

Filed May 28, 1954 2 Sheets-Sheet 2

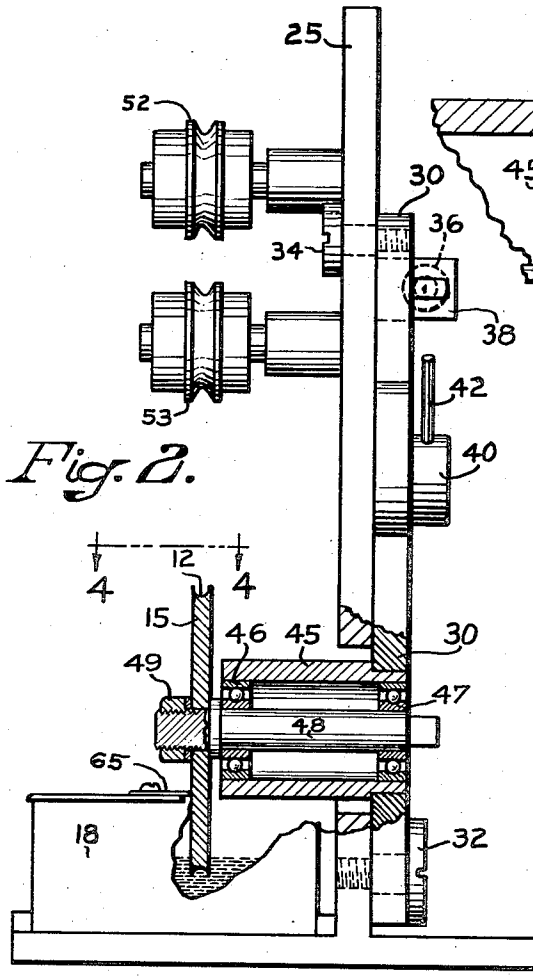


Fig. 2.

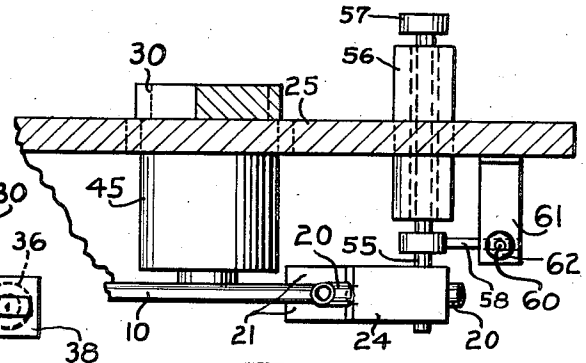


Fig. 3.

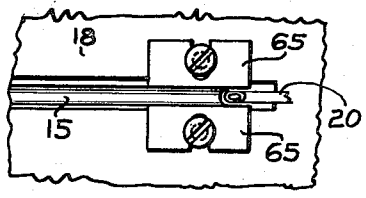


Fig. 4.



Fig. 5.



Fig. 8.

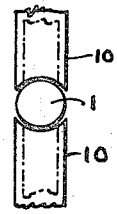


Fig. 7.

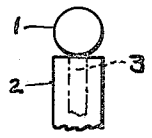


Fig. 6.

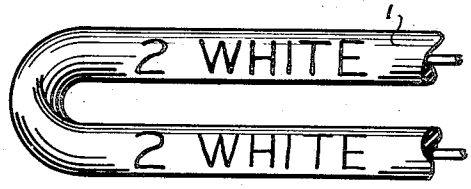


Fig. 9.

INVENTOR.
Duncan M. Gillies
BY
Clayton L. Jenks
ATTORNEY

United States Patent Office 2,898,849 Patented Aug. 11, 1959

2,898,849

ENGRAVING APPARATUS

Duncan M. Gillies, West Boylston, Mass., assignor to Duncan M. Gillies Company, Inc., West Boylston, Mass., a corporation of Massachusetts

Application May 28, 1954, Serial No. 433,206

3 Claims. (Cl. 101—37)

This invention relates to apparatus for printing cylindrical surfaces, and it particularly provides for printing by an engraving wheel on plastic coated wire, tubing and other extended cylindrical work pieces a circumferentially wide band of a desired marking.

Insulated electrical wire is customarily made by coating the conductive wire with rubber, neoprene, polyethylene or other suitable plastic materials. Various types of electrical installations, such as telephone circuits, require that each wire be identified as by a color or a printed marking, so that the electrician may connect wires of like markings and be able to identify the various circuits in a complex system. Various proposals have been adopted for marking wires, such as winding various types of colored thread spirally around the wire. But many people are color blind, or for other reasons the color marked wires are not always easily identified. It is therefore desirable to print a designation marking on each wire so that by the use of numbers or words the wire may be identified by any one who can read. However, a considerable percentage of coated or insulated wire is very small in diameter, such as 0.050 inch, and any attempt at printing a wording on such a wire by standard procedure would usually result in indistinguishable markings; hence it has not been feasible heretofore to adopt that desirable method of marking small wires. Similar problems apply to the marking of rubber tubing and other cylindrical articles.

It is the primary object of my invention to overcome such problems and to mark coated wire and other extended cylindrical work pieces by means of an engraving wheel which will apply the printing widely of the circumference of the work.

If plastic coated wire, for example, were printed by means of a cylindrical engraving wheel, the wheel periphery could engage the round surface theoretically only on a line contact, but pressure may succeed in widening that line somewhat, although such a printed band is necessarily very narrow. In accordance with my invention, I propose to engrave a desired printing on a cylindrical work piece by means of an engraving wheel which has a concave peripheral surface shaped to fit the round of the work and which has an intaglio engraving on that grooved surface of extensive width so as to apply a wide band marking on the work. The engraving may extend laterally to a desired extent on that concave surface, so that the printing will be applied circumferentially of the work to a corresponding extent, such as 120°, and only as limited by the ability of the wheel to contact and print the round surface. If the wire is to be marked on opposite sides, it may be passed between and printed by two engraved wheels having concave peripheries, which serve to print appropriate designations at desired intervals in diametrical opposition.

A further object of the invention is, therefore, to provide a satisfactory mechanism for this purpose which may be operated economically and efficiently for printing repeatedly such designations as have been engraved on one

or more concave wheels as the cylindrical work piece is passed longitudinally in printing contact with the engraving in the groove.

A further object is to provide a construction of this type in which the engraving wheel may be readily removed and replaced by a wheel of a desired annular groove size to fit the object being printed, and wherein the wheels may be adjustably and accurately positioned for that work size.

Another object is to provide a satisfactory ink transfer from a supply to the wheel engraving and to render the device practicable for a long life of service. Further objects will be apparent in the following disclosure.

Referring to the drawings illustrating one embodiment of this invention,

Fig. 1 is a front elevation of a two wheel machine arranged for printing opposed portions of a coated wire passed vertically between the engraved wheels;

Fig. 2 is an end elevation, partly in section to show one of the wheel mountings;

Fig. 3 is a fragmentary detail taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary detail of the fixed wheel mount taken on the line 4—4 of Fig. 2;

Fig. 5 is a detail showing a portion of the periphery of one of the engraving wheels;

Figs. 6 and 7 are diagrammatic views showing respectively the printing of a round body by cylindrical and grooved wheels; and

Fig. 8 and 9 are views, enlarged 5 times, of two wires of the same size printed respectively by the wheels of Figs. 6 and 7.

Referring first to the Figs. 6 to 9, if one attempts to print a given identification wording on a standard plastic coated wire 1 of small diameter, which may be less than 0.125 inch, by means of a wheel 2 having the engraving 3 on a cylindrical surface, as shown in Fig. 6, the wheel will make only a narrow band contact, depending on the pressure and the deformability of the coating, and the printing will be very small and subtend only a narrow arc of the coated wire circumference, as shown in the enlarged view of Fig. 8. If on the other hand, the same size of wire is printed by means of the concaved wheel 10 of Fig. 5, then, as indicated in Fig. 7, the engraving within the groove may be made wide and the printing will subtend a correspondingly wide angle, such as 120°, of the coated wire circumference, and the printed word will be large and legible, as indicated in Fig. 9 which shows a twisted wire printed on its opposite sides.

In accordance with this invention, a longitudinally extended cylindrical work piece, such as coated wire or rubber tubing, is printed by means of an engraving wheel 10, shown in Fig. 5, having a concave or grooved peripheral surface 12 shaped to interfit substantially correctly with the outer peripheral surface of the object being printed. The engraving wheel may be a steel disk having flat sides 13 and the printing groove 12 preferably of a substantially semi-circular shape and of such depth and radius that it will fit a major portion up to half of the circumference of the work piece. The engraving to accomplish the printing may be cut to subtend a wide band, such as 120°, more or less, of the work surface, although these dimensions may be varied as desired to provide a satisfactory designation. The annular groove 12 of the wheel is shaped as accurately as possible to provide a smooth and preferably a lapped surface. The words or numbers or other designating mark to be printed is cut in intaglio in this grooved steel surface in accordance with a suitable engraving procedure, so that when the engraving is filled with a printing ink and properly contacted with the work piece, the ink will be deposited on the work surface. The remainder of the groove and the wheel sides will be cleared

of ink by doctor blades so that only the engraving will apply the ink to the work.

Referring now to the Figs. 1 to 4 of the drawings, the construction there shown for printing both sides of a coated wire comprises two engraving wheels **14** and **15** which are made substantially as duplicates except for the engraving or intaglio markings thereon. The two engraving wheels are mounted on parallel axes in close peripheral opposition and so arranged that a plastic coated wire **16** may be passed tightly between the two wheels and the markings on each wheel will be printed on opposite sides of the plastic coating. The wheels are mounted for free rotation so that they are impelled only by the wire **16** which is drawn by suitable driving or reeling mechanism between the wheels. The wheels **14** and **15** respectively dip into reservoirs of ink **17** and **18** which are suitably supplied with an ink of a type that will serve for the particular work surface to be printed. Each wheel dips into the ink and in its rotation in the direction of the arrow will carry the ink upwardly at the outer peripheral portion. The surplus ink is removed by a set of doctor blades **20** and **21** so that the only ink remaining on the wheel at the engraving position is that which is carried in the intaglio engraving.

Each doctor blade **20** is accurately shaped to fit the concave groove of the wheel, and for this purpose a hollow quill, such as a nylon tube, may be used. The tube preferably has a comparatively thin wall of cylindrical shape which will easily shape itself to the semicircular groove **12**. Various other types of solid or hollow doctor blades may be employed for the purpose. The reservoir **17** or **18** is so shaped that the printing ink dripping back from the doctor blade may run into the reservoir there beneath. The doctor blades **21** may be thin resilient metal strips provided with bevelled and sharpened edges which engage the side faces of the wheel and scrape all ink therefrom. These blades **21** are preferably mounted by means of a screw on the underside of the housing **24** which carries the quill **20** in a hole therethrough. Two of the side blades **21** are so mounted on that housing as to scrape clean the opposite sides of the wheel **14** or **15**.

Various constructional features may be employed to mount the various parts. As illustrated, the device comprises a vertical steel plate **25** suitably mounted on and perpendicular to a horizontal base **26** so that it will stand properly. The left hand wheel **14** of Fig. 1 is removably mounted on a fixed axle support comprising a bolt **27** rotatable on two spaced ball bearings carried within a hollow housing similar to the other wheel mount, as will be described, and fixedly mounted on the steel plate **25**.

The other wheel **15** is mounted on a swinging lever **30** in such a manner that a wheel of correct groove size may be adjustably positioned to provide the required spacing for the selected size of wire, or tubing. This lever **30** is carried on a pivot screw **32** (Fig. 2) threaded into the bottom portion of the plate **25** which has an enlarged center portion forming a pivot bearing for the lever. The screw has a large flat surfaced head to hold the lever in place. The upper end of the lever carries a projecting screw **34** riding in an arcuate slot **35** in the plate **25**. The lever **30** is drawn towards the left by a spring **36**, the tension of which may be adjusted by means of a screw **37** threaded through a lug **38** projecting from the back face of the plate **25**.

The forward position of the pivoted lever **30** and the wheel **15** carried thereby is regulated by means of a cam **40** having low and high points, which may be a cylindrical disk mounted eccentrically on a pin **41** suitably projecting from and supported by the plate **25**. The cam may be adjusted manually by means of a lever **42** projecting therefrom. It will thus be seen that by revolving the cam **40** through a small angle about its mount **41** the movement of the lever **30** as caused by the spring **36** is adjustably limited, so that the wheel **15** will be held accurately by the spring in a given printing position as determined by the setting of the cam. The head of screw **34** may be set into a tight engagement with the sides of plate **25** to fix the arm **30** in position, if desired. This cam prevents the wheels from being injured by striking together when the wire is removed.

The wheel **15** is mounted on the side of the lever **30** as shown in Fig. 2. This comprises a hollow housing **45** having a reduced end fitted tightly into a hole in the lever and projecting at right angles thereto. The housing carries two spaced sets of ball bearings **46** and **47** which in turn support a spindle **48**. The wheel is removably secured on the front end of the spindle by a nut **49**. The wheel **14** is similarly mounted on an axle parallel to the axle **48**, except that the ball bearing housing is fixed in a hole bored in the plate **25**. Thus the two wheels **14** and **15** are carried in correct opposition to the wire **16** therebetween. The wire **16** may be passed between two deeply grooved freely rotatable pulleys or guides **52** and **53** suitably carried on posts projecting from the front face of the plate **25**, as shown in Fig. 2. The main purpose of these two pulleys is to prevent the wire from whipping around and thus to steady it in its passage between the two engraving wheels.

The doctor blade housing **24** is pivotally carried by a pin **55** (Fig. 3) projecting from the face of plate **25**. The pin **55** is pivotally mounted in an extended bushing **56** fitted in a hole in the plate **25** and arranged to prevent unsteadiness of motion of the doctor blades carried thereby. Also, the pin is arranged to slide freely endwise through the bushing for a slight distance as limited by the head **57** on the pin striking the bushing **56**. This permits the doctor blades to become adjusted to fit accurately against the sides and groove of the disk shaped engraving wheel and particularly the resilient or flexible blade **20** which rides in the engraving groove **12**. The side blades may bend to provide a correct contact. The pin **55** which is fixed to the housing **24** has a lever arm **58** projecting rearwardly, and the round doctor blade **20** is held tightly and yieldingly within the engraving groove **12** by means of a spring **59** connected to the end of that lever **58**. The spring is adjustably tensioned by means of a screw **60** and nut **62** carried by an L-shaped support **61** mounted on the plate **25**, as shown in Fig. 1.

Various other constructional features may be employed, such as a cover plate **64** on each of the ink reservoirs which hinder the evaporation of the ink solvent. Two supplemental doctor blades **65** may be mounted on the cover **64** on each side of and engaging the wheel sides close to their junction with the groove **12** of the wheel and next to the wheel at its upward travel through a slot in the cover plate **64**. These two blades **65** may be thin spring metal plates sharpened to a bevel, like the blades **21** on the opposite sides of the wheel. Either pair of blades **21** and **65** may be omitted or otherwise mounted and arranged.

It will also be appreciated that the wire may be run horizontally in the dotted line position of the wire in Fig. 1, instead of vertically as illustrated. This may be done where the wire is close to the point of issuing from an extrusion machine arranged to mould a plastic coating on a metal wire. In that case, one of the engraving wheels will be omitted, and the wire may be held down in a satisfactory printing engagement with the engraving wheel by means of a grooved roller which may be shaped the same as the omitted engraving wheel. This involves merely turning on its side the device illustrated and rearranging the ink pot and associated features.

An important feature of the invention lies in the fact that the sides of the wheel preferably form a comparatively sharp or beveled edge with the curved surface **12** of the engraving groove. If otherwise there were a cylindrical surface outside of that curved portion **12**, it would

carry ink and thus print a line on the work, unless a special doctor blade construction were employed. As shown in Fig. 5, the sides are parallel and meet the groove 12 at a narrow or sharp edged ridge, so that the side doctor blades and the central cylindrical doctor blade can sweep away all of the excess of ink and leave only that in the engraving groove, so that the wire will receive only the desired markings.

The operation of the device will be apparent in view of the above disclosure. A coated wire or tube 16 is drawn downwardly by suitable driving or reeling mechanism and into engagement with the opposed surfaces of the two engraving wheels which have been adjusted by cam 40 into close printing contact with the work piece 16. A printing ink supplied by the ink pot in which each wheel dips is carried only in the intaglio engraving, because of the removal of excess ink by the flexible round doctor blade 12 and the thin side scraping blades. In the illustrated construction the designations engraved on the two wheels are printed on opposite sides of the wire in a repeated sequence. If a different size of wire or tubing is to be engraved, then the disk shaped wheels are to be replaced by wheels of a correct concave groove size which fits the curve of the work piece. The wheel grooves are to be accurately shaped, and preferably of a groove depth which interfits with nearly half of the work circumference. The printing from the engraving may be of varied widths, but to take advantage of the principles of this invention, such engraving may extend laterally to subtend an angle of at least 60° of the circumference of the round work piece. Since the engraving groove has a uniform or fixed radius profile, the work piece will interfit smoothly therewith and roll the wheel easily as it travels downwardly and the engraving will print the work with sharp outlines. Various other advantages will be apparent to one skilled in the art.

It will now be appreciated that various modifications may be made in the structure and that the above description is to be interpreted as setting forth the principles of the invention and a preferred embodiment thereof and not as imposing limitations on the appended claims.

I claim:

1. Apparatus for printing opposite sides of an extended, longitudinally moved cylindrical work piece comprising two disc shaped wheels whose peripheries have continuous circumferential concave grooves interfitting with the work piece and provided with intaglio engravings thereon, each wheel having opposed side faces meeting the groove at a sharp edged ridge, axially parallel spindles supporting said wheels in opposition for free rotative movement by and in close peripheral contact with opposite sides of the moving work piece, ink reservoir means for supplying ink to each wheel disposed beneath said wheels whereby the wheels may pick up ink as they are rotated therepast with the workpiece passing between the wheels and their respective reservoir means, means for adjusting the wheel spindle positions for marking different work sizes, a doctor having a cylindrical face interfitting with each groove and serving to remove excess ink not carried by the engraving, a doctor having flexible blades engaging the wheel side faces which remove ink therefrom, and guides arranged to feed a work piece into contact with both wheel grooves, said doctor blades for each of said wheels being disposed above the respective reservoirs at a point on the respective wheels remote from the point of engagement of the wheel with the workpiece and between the reservoir and printing point and being so arranged that all excess ink at each side of the ridge and within the groove is returned to a point remote from the work and prevented from contact therewith.

2. Apparatus for printing opposite sides of an extended longitudinally moved cylindrical workpiece comprising two wheels whose peripheries have continuous circumferential concave grooves interfitting with the workpiece and provided with intaglio engravings thereon, each wheel having opposed continuous side faces meeting the peripheral groove at sharp edged ridges, a standard, axially parallel spindles mounted on the standard with their axes in a substantially horizontal plane and removably supporting the wheels in opposition for free rotative movement by and in close peripheral contact with opposite sides of the moving workpiece, ink reservoir means for supplying ink to each wheel disposed beneath said wheels whereby the wheels may pick up ink as they are rotated therepast with the workpiece passing between the wheels and their respective reservoir means, a doctor having a cylindrical face interfitting with each groove for removing excess ink therefrom, independent doctors having flexible blades engaging said wheel sides close to the ridge and cooperating with the cylindrical doctor for removing all excess ink, said doctor blades for each of said wheels being disposed above the respective reservoirs at a point on the respective wheels remote from the point of engagement of the wheel with the workpiece and between the reservoir and printing point, and guides arranged for feeding the workpiece in a generally vertical direction into contact with the wheel grooves, said wheels serving to print the workpiece simultaneously on its opposite sides.

3. Apparatus according to claim 2 comprising means for resiliently urging said wheels into peripheral contact with the work piece and an adjustable stop for limiting the relative movement of the wheels and preventing their peripheral contact when the workpiece is absent.

References Cited in the file of this patent

UNITED STATES PATENTS

1,138,342	Wood	May 4, 1915
1,683,774	Haase	Sept. 11, 1928
1,793,082	Goss	Feb. 17, 1931
1,812,884	Leech	July 7, 1931
1,958,717	Schake et al.	May 15, 1934
2,094,628	Whitehead	Oct. 5, 1937
2,184,552	Hinsky	Dec. 26, 1939
2,185,223	Paynter	Jan. 2, 1940
2,186,788	Olson	Jan. 9, 1940
2,211,792	Rohland	Aug. 20, 1940
2,227,694	Bates	Jan. 7, 1941
2,270,374	Kanitz	Jan. 20, 1942
2,333,172	Grupe	Nov. 2, 1943
2,351,224	Nystrom	June 13, 1944
2,600,254	Lysobey	June 10, 1952
2,632,918	Bergstein	Mar. 1, 1953
2,739,528	Lowe	Mar. 27, 1956

FOREIGN PATENTS

152,876	Australia	Aug. 18, 1953