Aug. 2, 1938. M. M. SAFFORD 2,125,817

PRINTING ROLL

Filed Sept. 11, 1931

Fig. 1.

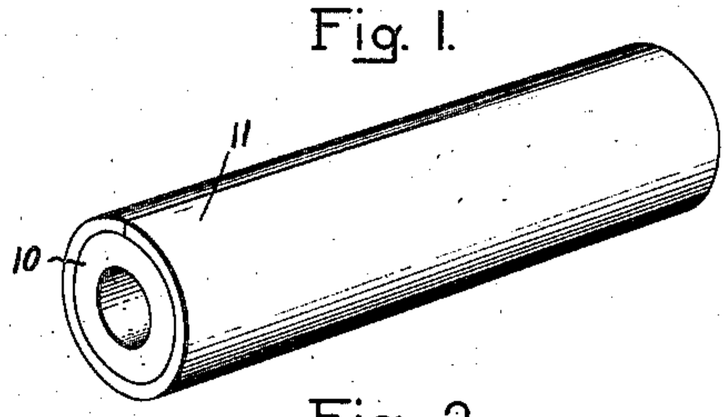


Fig. 2.

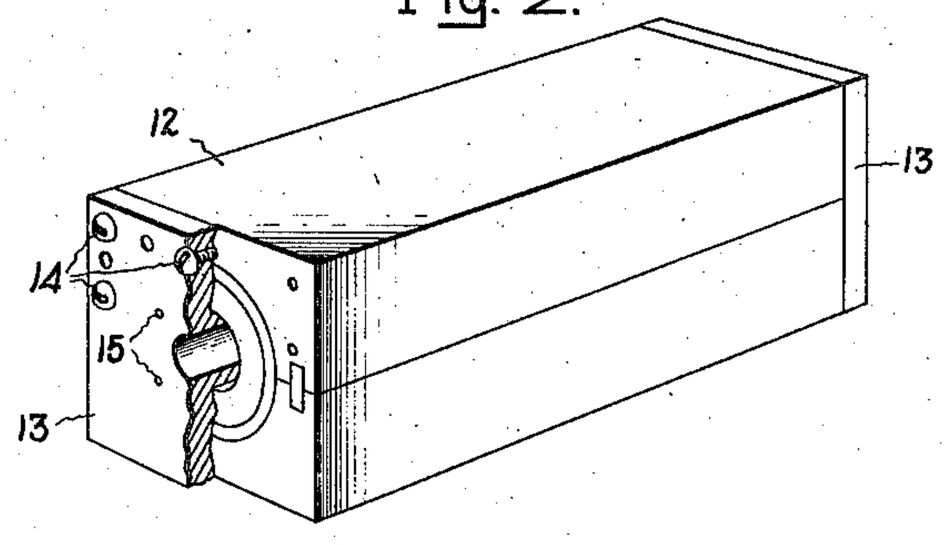


Fig. 3.

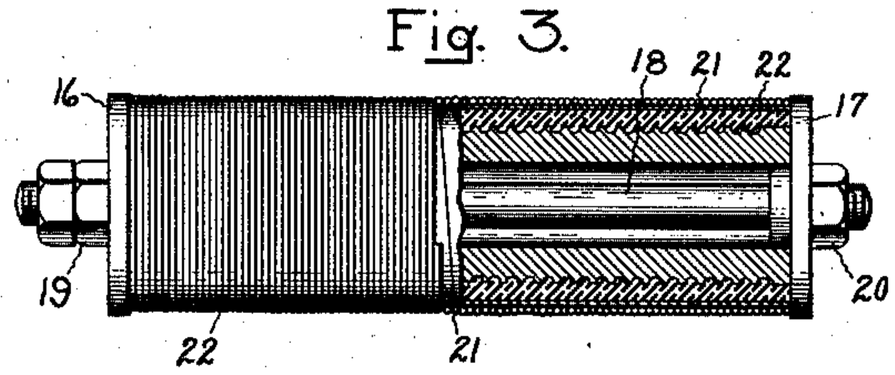


Fig. 4.

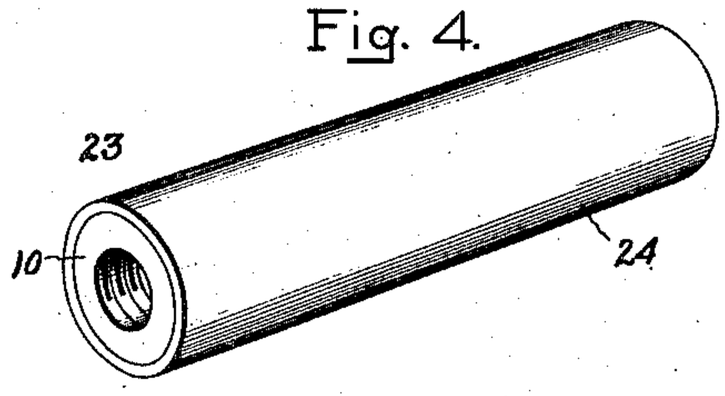
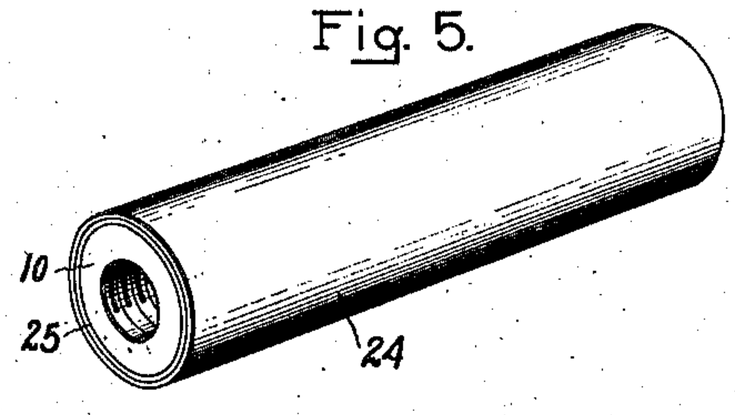


Fig. 5.



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UNITED STATES PATENT OFFICE

2,125,817

PRINTING ROLL

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Application September 11, 1931, Serial No. 562,353

5 Claims. (Cl. 91—67.8)

The present invention relates to printing rolls.

A principal object of the invention is to produce an improved printing roll which will be oil resistant, will not cause distortion of the characters being printed and have longer life than the present printing roll constructions.

Other and further objects of the invention will be more apparent as the description thereof proceeds.

In the printing industry it is often required to transfer printing from an embossed metal roll to a rubber covered roll which in turn transfers it to paper or some other material. After these rubber rolls have been in use for a short period of time they absorb oil from the ink causing distortion which in turn causes inaccurate printing. The rubber covered rolls or rolls made of glycerine and glue compositions which are also used in the printing industry are particularly affected in hot weather and by friction. The rolls must be kept resilient and of the proper consistency suitable to the season so that rolls made for winter use cannot be successfully used in warm weather and vice versa. Present types of rolls have short life and in industries where considerable printing is done, as for example in the newspaper industry, frequent changing of rolls especially in hot weather is necessary in order to prevent delay in operations.

In accordance with the present invention a printing roll has been constructed wherein the surface is made of a material, which like rubber, is resilient and flexible, but unlike it does not absorb oil, does not soften appreciably or melt in hot weather or under friction, but retains its flexibility and resiliency, thus permitting accurate reproduction of characters being printed and which results in a printing roll having longer life than printing rolls of present construction.

For a consideration of what is believed to be novel and the invention, attention is directed to the following specification, in connection with the accompanying drawing, and the claims appended thereto.

The drawing illustrates somewhat diagrammatically the various steps in the process of making the printing roll as well as the finished product. In the drawing, Fig. 1 is a view in perspective showing the roll in a preliminary stage of construction carrying a surface sheet of alkyd resin and ready for the mold.

Fig. 2 is a perspective view partly broken away showing the mold containing the roll illustrated in Fig. 1.

Fig. 3 is a view partly in elevation and partly in section showing the roll held in place by specially constructed means to permit proper curing of the same, and ready for the oven treatment which follows.

Fig. 4 is a perspective view of the finished product, and

Fig. 5 is a view in perspective of a slightly modified form of the roll,

In carrying the invention into practice a roll is constructed wherein the surface is of a flexible type of alkyd resin. As is known, alkyd resins include all those complexes resulting primarily from the interreaction of a polyhydric alcohol such as glycerine, and a polybasic acid or its anhydride, such as phthalic anhydride. These resins may be prepared in various degrees of flexibility, the flexibility being permanent in character. Such resins are more fully described and claimed in the copending application of R. H. Kienle and H. C. Rohlfs, Serial No. 393,119, filed Sept. 16, 1929 now Patent No. 1,897,260 dated Feb. 14, 1933 and assigned to the same assignee as the present invention. Briefly, the resins are prepared by reacting suitable proportions of dibasic aliphatic acid, for example succinic or adipic acid, and dihydric alcohol, for example, ethylene glycol, with the usual alkyd resin ingredients, namely, a polyhydric alcohol having preferably three or more hydroxyl groups in the molecule, for example, glycerine, and a polybasic aromatic acid or its anhydride for example, phthalic anhydride. By varying the ratio of dibasic aliphatic acid-dihydric alcohol ester to polyhyric alcohol-polybasic acid ester the degree of flexibility of the resinous compositions may be varied. Increasing, for example, the ratio of the former to the latter increases the flexibility of the resulting resin.

As an example of the preparation of a resin suitable for use in the construction of the printing roll of the present invention the following is given.

Glycerine, phthalic anhydride, ethylene glycol and succinic acid are taken in proportions such that the ratio of glycol succinate to glycerol phthalate is 4:1. The ingredients are heated together in an aluminum vessel to a temperature of 180°–200° C. until there is evidence of gelation. The melt is then poured into shallow amalgamated tins and cured at about 150° C. or higher from about three to five weeks. The cured resin is tough, resilient and exceedingly flexible under all conditions.

In constructing the printing roll a suitable body portion or core 10 is first taken. This body por-

tion may be of any material suitable as a core material for receiving the alkyd resin layer. For example, it may be constructed of steel. On this core is placed a layer or sheet 11 of the flexible resin, the resin being wrapped around the core and joined at the meeting edges. In order to prepare this sheet of resin the following procedure is satisfactory:

A composition which is by weight 75% completely cured, 4:1 resin prepared as outlined above is broken down on ordinary rubber compounding rolls into a fine flour consistency and is mixed with 25% of twenty-four hour cured 4:1 resin. After working the mixture on the compounding rolls for a period of time the mass is formed into a rubber-like sheet. Such fillers as cork, wood flour, cotton flock, lamp-black, titanium dioxide and the like may be incorporated with the resin, although the pure resin is entirely satisfactory. In order to have a dense material for molding the composition is next placed between flat steel chromium plated plates and pressed under heat into a flat sheet of about $\frac{1}{16}$" thickness. The plates are then cooled and the sheet removed. This is the sheet 11 enveloping the core 10.

The mold 12 shown in Fig. 2 is an aluminum split mold provided with end plates 13 removably secured thereto as by screws 14. The mold is lined with brass tubing (not shown) and is chromium plated on its inner surfaces. It is designed to hold the core 10 of the printing roll and the sheet of resin 11 wrapped thereon as clearly shown in Fig. 2. After the core wrapped with the alkyd resin has been inserted in the mold the mold is closed and allowed to heat, then pressure is applied. Holes 15 are provided in the end plates of the mold through which excess resin may extrude as pressure is applied. Pressure is applied very slowly until the mold has been closed. A pressure of for example 1500–2000 pounds per square inch at a temperature of about 150° C. is satisfactory. After a short time, about 10 minutes, under heat and pressure, the mold is cooled, preferably under pressure, after which the roll is removed. At this stage the roll is considerably over size and the layer of resin is still not totally cured. It is well to mention that the inner surfaces of the mold should be adequately covered with a material such as a mixture of soap and mica powder to prevent sticking upon extraction of the roll therefrom.

The roll is now ready for the curing operation. This operation is an important step in the process. In order to successfully cure the sheet of resin and at the same time have it keep its shape it has been necessary to provide special means for clamping or holding the roll while the curing operation takes place. In Fig. 3 this means for holding the roll in place is shown. The roll taken from the mold is first clamped between end plates 16 and 17 held in place by means of a rod 18 passing through the center of the core 10. The rod 18 is fixed to the end plates by nuts 19 and 20, screwed on the threaded ends thereof. As will be apparent later, the object of these end plates is to prevent the resin which is still in the plastic stage from being forced over the ends when wound with tape and wire.

The end plates being in place and the roll clamped therebetween, a single layer 21 of medium weight cloth tape is wound as tightly as possible over the the whole roll. The purpose of this tape is to allow gases generated during curing of the resin to be expelled and at the same time to prevent the layer of cord or wire which will cover the surface from sinking into the roll.

After the roll has been covered with tape it is then wound tightly with a single layer 22 of strong cord or wire, preferably wire, and of say 40 mil dimension. The unit is now placed in a suitable oven, preferably one which is electrically heated, and maintained at a temperature of 140° C. for a period of twenty-four to ninety-six hours depending on the degree of hardness desired in the resin surface. After ninety-six hours composition has reached the maximum hardness for a 4:1 type of composition.

When the roll has been cured for the requisite period of time it is removed from the oven and allowed to cool slowly. The surface is then machined to size on a lathe using preferably a cutting speed of about 250 revolutions per minute and a feed of about 100 turns per inch. A pointed nose tool having a large rake is satisfactory for this purpose. A smooth surface is thus obtained. An extremely smooth surface can be obtained by providing the surface while machining with emery flour and water.

In Fig. 4 the finished roll 23 is shown, embodying the core 10, and the finished alkyd resin surface 24 on the core.

Fig. 5 shows a slightly modified form of construction wherein there is interposed between the core 10 and alkyd resin layer, a sheet or layer 25 of a resilient material adapted to increase the cushioning or resiliency of the roll. In some cases such a construction may be desirable, as for example in the construction of the cushioning roll in the impression type of rolls. Among suitable resilient materials for this purpose may be mentioned rubber, compositions of cork, gelatin, or oxidized oils, or suitable compositions of such materials. In some cases where an intermediate layer of resilient material is employed it may be practical to provide the layer with a surface of flexible alkyd resin by applying thereto a suitable lacquer embodying such resin or a layer of the flexible resin may be directly cast either on the core itself or on the intermediate layer 25. At present, however, I prefer the construction shown in Fig. 4 made as described in detail in the foregoing specification.

While the preferred resin composition is one wherein the ratio of dibasic aliphatic acid-dihydric alcohol ester to polyhydric alcohol-polybasic acid ester is 4:1, this ratio is not the only one which may be employed. Successful combinations for the purpose intended may be made by varying the ratio between the limits 2:1 to 8:1.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A printing roll comprising a steel core surfaced with a flexible resilient, non-oil-absorbent, printing ink resistant alkyd resin, said resin being the product of reaction of glycerine, phthalic anhydride, glycol and succinic acid.

2. A printing roll comprising a core and a surface layer on said core comprising the product of reaction of a polybasic aromatic acid, polyhydric alcohol having three or more hydroxyl groups in the molecule, a dihydric alcohol and a dibasic aliphatic acid, said surface layer being resilient, non oil-absorbent and printing ink resistant.

3. A printing roll provided with a surface layer of non-oil absorbent, printing ink resistant, resilient resin, said resin being the product of reaction of glycerine, phthalic anhydride, a dihydric alcohol and a dibasic aliphatic acid.

4. A printing roll comprising a core, an intermediate layer of resilient material and a surface layer of non-oil absorbent, printing ink resistant alkyd resin in the permanently flexible and resilient state, said resin being the product of reaction of glycerine, phthalic anhydride, a dihydric alcohol and a dibasic aliphatic acid.

5. A printing roll comprising a metallic core and a printing surface fixed on said core, said printing surface comprising a layer of permanently flexible, oil-resistant alkyd resin comprising the cured product of a mixture of completely cured and partially cured products of reaction of glycerine, phthalic anhydride, dihydric alcohol and dibasic aliphatic acid.

MOYER M. SAFFORD.