

[54] **METHOD OF MAKING WIPING CYLINDER OF STEEL ENGRAVING PRINTING PRESS**[75] Inventor: **Gualtiero Giori**, Lausanne, Switzerland[73] Assignee: **De la Rue Giori S.A.**, Switzerland[22] Filed: **Oct. 24, 1973**[21] Appl. No.: **409,265****Related U.S. Application Data**

[60] Division of Ser. No. 175,224, Aug. 26, 1971, Pat. No. 3,785,286, which is a continuation-in-part of Ser. No. 833,622, June 16, 1969, abandoned, and a continuation-in-part of Ser. No. 462,355, June 8, 1965, abandoned.

[30] **Foreign Application Priority Data**

June 18, 1964 Italy..... 48397/64

[52] **U.S. Cl.**..... 427/55; 427/293; 427/346; 427/358[51] **Int. Cl.**..... **B32b 31/22**[58] **Field of Search**..... 156/153, 154, 333; 117/94, 117/72, 2 R, 8, 95, 75, 79, 161 UF, 161 UE, DIG. 3; 118/232, 413, DIG. 15; 29/130, 131, 132; 101/167, 169[56] **References Cited****UNITED STATES PATENTS**

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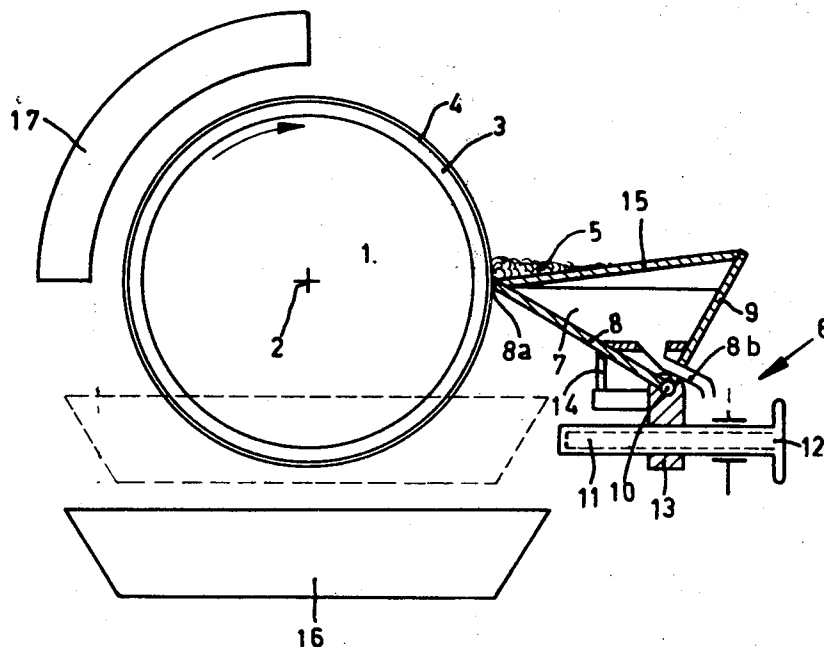
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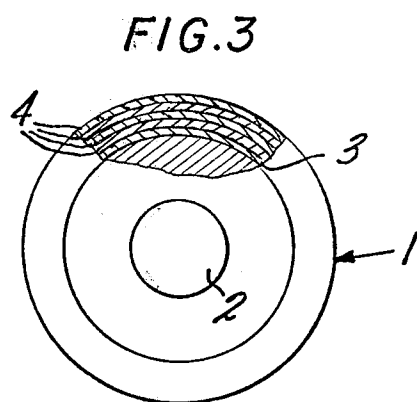
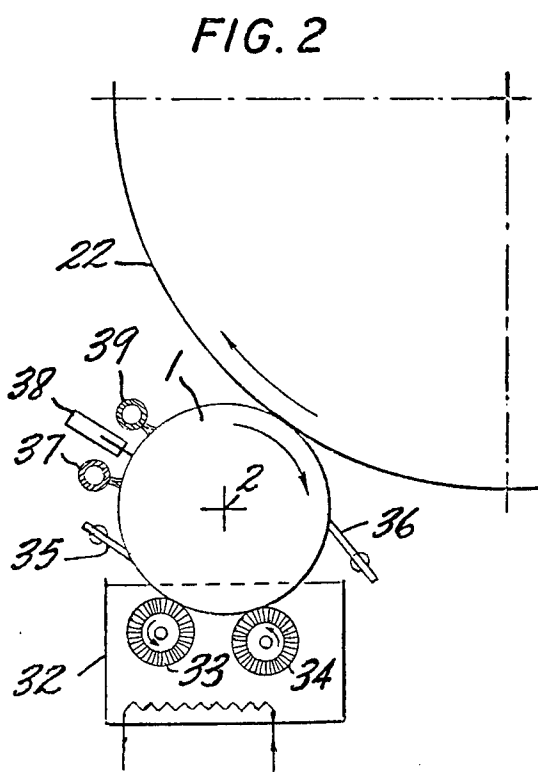
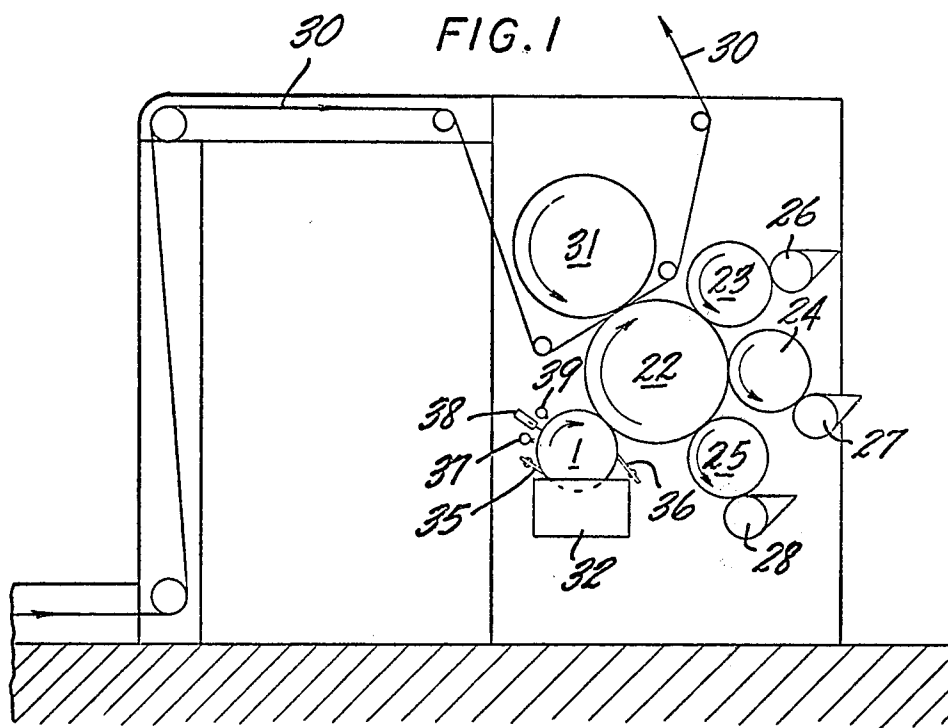
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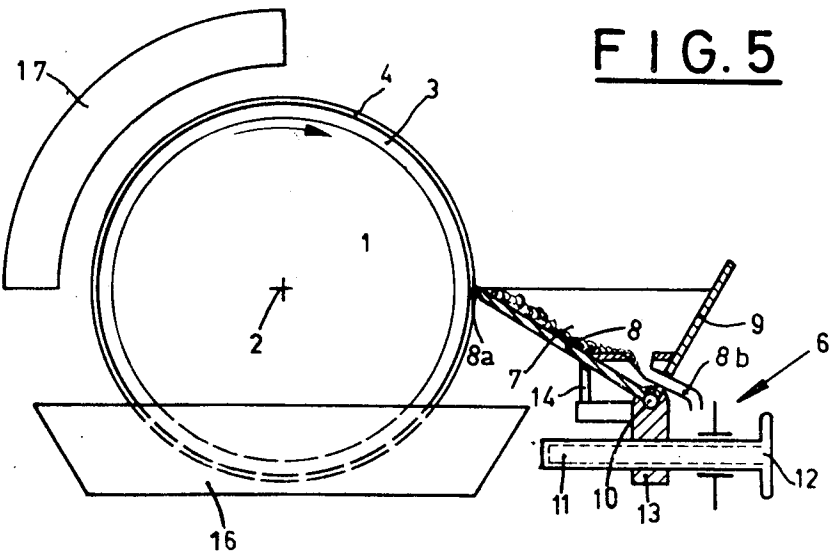
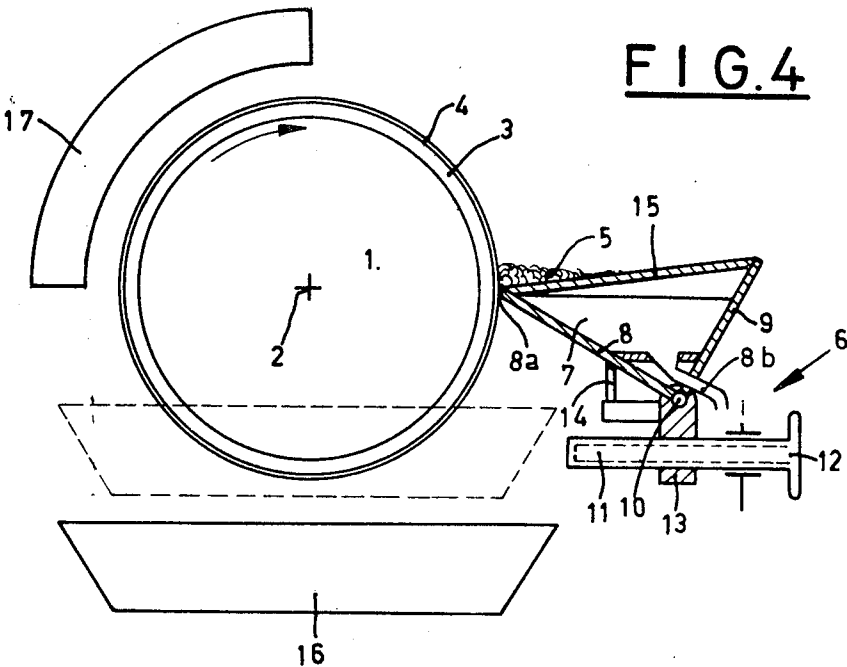
ABSTRACT

The wiping cylinder of a steel engraving printing press is coated with a plurality of thin plastic layers over a rubber base layer. When the wiping cylinder is to be cleaned with an organic solvent, the plastic coatings are of a thermoplastic synthetic resin that is soluble in water but not in organic solvents, for example polyvinyl alcohol that is partially saponified and contains acetyl groups. When the wiping cylinder is to be cleaned by an aqueous solution, the coatings are of a synthetic resin such as polyvinyl chloride that is not soluble in water. The thin plastic layers are applied successively by means of a doctor blade assuring smoothness, uniformity and exact thickness of the layers, and each layer is hardened before the next is applied.

20 Claims, 5 Drawing Figures

SHEET 1 OF 2





METHOD OF MAKING WIPING CYLINDER OF STEEL ENGRAVING PRINTING PRESS

This application is a divisional of my application, Ser. No. 175,224, filed Aug. 26, 1971, now U.S. Pat. No. 3,785,286 which was in turn a continuation-in-part of applications Ser. Nos. 833,622 filed June 16, 1969 and Ser. No. 462,355 filed June 8, 1965, both now abandoned.

The invention relates to a method of making a wiping cylinder for steel engraving printing machines and to a method of renewing the surface layer of such wiping cylinder.

With steel engraving printing it is known to use at least one wiping cylinder as a wiping device for the engraved printing plate or the engraved cylinder, which has the task of pressing into the engraving grooves of the printing plate or the engraved cylinder the color or colors applied on the printing plate or the engraved cylinder by the single-color rollers and to clean the color from the plenum, i.e., the non-printing surface outside the engraving grooves.

To obtain good quality printing, use is preferably made of two wiping cylinders contacting the printing plate in sequence, of which the first cylinder has the function of pressing the colors into the engraving grooves and of removing already a substantial part of the color to be found on the plenum, whereas the second wiping cylinder has the function of cleaning the plenum completely free from color.

In all cases, the surface of the wiping cylinder must comply with quite definite requirements if satisfactory wiping is to be obtained. Furthermore, the surface layer of the wiping cylinder must be adapted to be capable of being cleaned continuously of colors adhering thereto, so that the wiping cylinder surface coming each time afresh in contact with the printing plate is completely free from color. For this purpose it is known to clean the wiping cylinder surface continuously with a preferably organic solvent. As a cleaning bath, trichlorethylene or a similar organic compound has heretofore been used practically exclusively.

As trichlorethylene is comparatively costly and, for economical use, requires a recovery plant, it has already been proposed to use as a solvent a considerably less expensive solution, for example petroleum.

Even more advantageous and still cheaper, it has already furthermore been proposed to use simply water, to which detergents and tension relieving means usual in the trade have been added.

As the dissolving capacity of all other solvents for the colors used in steel engraving printing is not so great as that of trichlorethylene, it has also already been proposed to free the wiping cylinder surface mechanically of the greater part of the adherent color before contact with the petroleum bath by means of a scraping blade. This also provides at the same time the advantage that the greater part of the generally speaking valuable printing color can be recovered.

With the use of petroleum or simple aqueous cleaning fluids, it is, generally speaking, necessary to use a scraper device to free the wiping cylinder surface of the liquid film adhering thereto as it comes out of the cleaning bath.

Up to the present, a gelatine layer has commonly been used as the surface layer for the wiping cylinder. The gelatine layer is struck on the jacket of the wiping

cylinder by means of a cloth base. Such known gelatine layer, has, however, a number of disadvantages:

1. The gelatine layer has only a very restricted length of life. From experience it can only be used for approximately 60,000 printings, which with modern printing machine corresponds to a duration of two days, whereupon the gelatine layer must be renewed, and this process is comparatively costly.

2. The gelatine layer is extraordinarily sensitive and can be scratched, for example by sharp engraving edges or small particles of dirt, whereby the said layer immediately becomes unusable and must be replaced in its entirety.

3. The gelatine layer is also very sensitive to outside influences, such as variations in temperature and the moisture content of the air. Accordingly, it is necessary that a wiping cylinder coated with a gelatine layer should not be left in the machine overnight or during long interruptions in the work, but has to be stored in a heated cupboard or where there is air conditioning. This always means dismantling, and at the beginning of the work, the reinstallation of the wiping cylinder. If this were not done, the gelatine mass, under the effect of variations in the temperature, would "work" which easily brings the risk of the formation of cracks.

4. As the gelatine layer is put on a cloth base which itself must be glued to the wiping cylinder jacket, the said layer necessarily has an overlapping joining part, which is very disadvantageous on two counts; in the first place the said overlapping place must naturally never come into contact with the printing plate or the engraved cylinder to be wiped, so that care must be taken to see that the wiping cylinder always turns in phase with the printing plates or the engraved cylinders, and this means that it is always exactly the same sections of the gelatine layer which carry out the actual wiping function and come into contact with the printing plates. Accordingly, it is always exactly the same portions of the gelatine layer that are subjected to strain and are used up, with resultant rapid wear and tear of the wiping cylinder surface.

Furthermore, the seam of the gelatine layer makes it impossible for the scraping blade to glide smoothly over the wiping cylinder surface so as to remove the adhering color in the main part from the wiping cylinder surface or, after treatment in the cleaning bath, to free it from the adhering liquid film. Still less, because of the said overlapping place, is a rubbing clean of the wiping cylinder surface possible by means of a strip wiping device, i.e., without the use of solvents.

For cleaning of wiping cylinders equipped with a gelatine layer, one is accordingly still forced to use a highly effective organic solvent, i.e., trichlorethylene.

5. If the surface of the gelatine layer is once made unusable by wear or by the occurring of the scratches, then it is necessary to remove the whole layer together with its cloth base from the cylinder jacket, and to replace it in its entirety with a new layer. It is not possible to renew the damaged cover layer of the gelatine mass.

The aim of the invention is to overcome the above mentioned disadvantages previously known with wiping cylinder layers. The method proposed for this purpose for the production of the surface of the wiping cylinder in single color or multicolor steel engraving printing machines, has the feature that a cylinder coated with a rubber layer is covered with a first layer of a synthetic plastic which is flowable in the state of use and has good strengthening properties; this plastic layer is

evenly distributed by means of at least one blade adjustable as described hereinafter disposed parallel to the axis of the cylinder and moveable relative to this; finally this first inner layer is allowed to harden at least partially, and then with repetition of the operations described, a determined number of further plastic layers are applied in sequence to the cylinder surface until the total thickness reaches a prearranged value and in the hardened out state, the covering layer gives the surface of the cylinder suppleness and good gliding properties. To prevent shrinking effects during the hardening of the layer which can result in cracks or unevenness, the thickness of each layer is chose sufficiently small, in general less than 1 mm.

When the wiping cylinder is to be cleaned during the printing process with an organic solvent, for example trichlorethylene, a particularly suitable synthetic resin for the process in accordance with the invention is a synthetic resin that is soluble in water, but in which in organic solvents dissolve with difficulty if at all, viz a polyvinyl alcohol that is partially saponified and contains acetyl groups. A thermoplastic synthetic resin of this type is known under the registered trade mark "Mowiol" and is produced by the Farbwerke Hoechst A.G. Germany. If the wiping cylinder is to be cleaned with an aqueous solution, a synthetic resin nonsoluble in water such as polyvinyl chloride is recommended, for example, that known under the trade name "Solvic" 340 (produced by Solvay Cie, Brussels, Belgium), or under the trade name "Hostalit P/VP 3475" (produced by Farbwerke Hoechst A.G. Germany).

The product known under the registered trade mark "Mowiol" designates a group of polyvinyl alcohols of various degrees of polymerization and hydrolysis, which with water form highly viscous solutions with good protective colloidal effect. The aqueous solution dries to a clear comparatively solid film and was previously used preferably in the adhesive, paper and textile industries as layers for nylon yarn, as a gel agent for the production of cosmetics and the like.

The plastic layer of the invention overcomes all the disadvantages mentioned under points 1 to 5 found with the previously known gelatine-covered wiping cylinder. The holding power of such plastic layer is effective for at least 3 to 6 months on a basis of approximately 30,000 printings per day. It is practically resistant to all external influences, in particular to variations in temperature and variations in the moisture content of the air. The wiping cylinder accordingly does not need to be stored in a cupboard with air circulation during intervals in the work, but can remain positioned ready for use in the printing machine. The plastic layer has no seam or joining place, but a completely smooth surface, so that work can be done with a continual "phase displacement" of the parts of the layer coming in contact with the printing plate. This means that all regions of the wiping cylinder layer are brought to an equal extent into the actual wiping function, and accordingly are evenly stressed. It is possible therefore to take care, for example, that the region of the wiping cylinder surface coming in contact with the pressure plate on each turn is displaced each time through an angle of 6°, so that it is only after 60 printings that the original wiping cylinder place then comes in contact with the pressure plate. Furthermore, with the seamless synthetic layer, scraping blades can be used for mechanically stripping off the color and/or the liquid film

from the wiping cylinder surface. Similarly, the wiping cylinder surface can be rubbed clean with a strip wiping device.

The synthetic layer is also substantially less sensitive to the formation of cracks than is a layer of gelatine.

A further important advantage consists in that after the wear and tear of the cover layer of the plastic mass, one is not forced to renew the whole wiping cylinder layer, but it is sufficient simply to remove the damaged cover layer mechanically, and here, in the case of a water-soluble plastic, which dissolves with difficulty if at all in organic solvents, the cover layer can be softened or dissolved previously in water before being mechanically removed, whereupon by putting on a new plastic cover layer, the original diameter of the wiping cylinder surface is again produced. The long life of the plastic layer of the invention as well as the possibility of simple renewal of only the cover layer, represent an extraordinary saving in expense in comparison with the previously known wiping cylinder layers.

It has furthermore been seen that the quality of the printing produced with the wiping cylinder is improved with the use of a plastic layer.

The invention will now be described in greater detail with reference to the accompanying drawings in which:

FIG. 1 is a schematic view of a steel engraving printing machine having a wiping cylinder made in accordance with the method of the present invention.

FIG. 2 is a schematic view on a larger scale of the wiping cylinder and associated parts.

FIG. 3 is a schematic end view, partially in cross section, of a wiping cylinder, the thickness of the layers being exaggerated for clarity.

FIG. 4 is a diagrammatic view of a device for applying a surface layer to a wiping cylinder.

FIG. 5 is a similar diagrammatic view illustrating the scraping off of the used cover layer of the wiping cylinder using a water soluble synthetic resin.

In FIG. 1, there is shown schematically a steel engraving printing machine having a wiping cylinder 1 made in accordance with the method of the present invention. The wiping cylinder 1 is mounted in position to engage a plate on the plate cylinder 22 to which ink is supplied by one or more inking rollers 23, 24 and 25 with their associated inking devices 26, 27 and 28 respectively. A paper web 30 to be printed passes between the plate cylinder 22 and an impression cylinder 31. The directions of rotations of the respective cylinders and rollers and the direction of travel of the paper web are indicated by arrows. It will be seen that the inking rollers 23, 24 and 25 turn in the opposite direction from the plate cylinder 22 and hence have a rolling engagement with a plate on the plate cylinder while the wiping cylinder 1 turns in the same direction as the plate cylinder and hence has a wiping engagement with the plate. After ink has been applied to a plate on the plate cylinder by the inking rollers 23, 24 and 25, the plate is wiped by the wiping cylinder 1 to press the ink into the engraved grooves and remove it from the plenum of the plate before it reaches the impression cylinder 31.

The wiping cylinder 1 is kept clean by a cleaning bath in a container 32 as shown in FIGS. 1 and 2. Rotating brushes 33 and 34 are shown in the bath. A doctor blade 35 removes the cleaning fluid from the wiping cylinder. In case it is desired to reclaim a portion of the ink or to reduce the contamination of the cleaning

bath, a doctor blade 36 is provided in position to engage the surface of the wiping cylinder before it enters the bath. When an aqueous solution is used for the cleaning bath, a water spray 37, squeegee 38 and air drying pipe 39 are provided following the doctor blade 35. When trichlorethylene is used as the cleaning bath, the elements 37, 38 and 39 are not needed.

As shown schematically in FIG. 3, the wiping cylinder 1 has a shaft or axle 2. The periphery of the cylinder body is covered with a base layer 3 of rubber on which a plurality of plastic layers 4 have been successively applied.

A device 6 for applying the successive layers is shown schematically in FIG. 4. This device can also be used for replacing the worn cover layer as illustrated schematically in FIG. 5. In applying the successive plastic layers to the wiping cylinder 1, the cylinder is mounted for rotation about its axle or shaft 2. During the process the cylinder is put into rotation by suitable means which are not shown in the drawings, the direction of rotation being indicated by an arrow. As the cylinder is rotated, a layer of plastic is progressively applied by the device 6.

As shown in FIG. 4 the device 6 comprises an elongated container 7 which extends lengthwise of the cylinder to be treated. The container 7 comprises an inclined base 8, an inclined rear wall 9, opposite end walls 7a and a removable cover plate 15. On the edge of the base 8 toward the wiping cylinder, there is provided a scraper blade 8a which extends parallel to the cylinder axis over the entire length of the jacket of the cylinder. It is naturally also possible for the scraper blade 8a to form part of the base plate 8 itself. The scraper blade 8a is disposed at a small angle of inclination to a plane defined by the edge of the scraper blade and the axis of the cylinder when the container is in operative position as shown in FIG. 4.

The container 7 is tiltably mounted by means of a shaft 10 on a support 13. An abutment 14 on the support 13 is engageable by the base 8 of the container to position the container relative to the support. The support 13 and the container 7 carried by it are movable toward and away from the wiping cylinder 1 by means of a threaded shaft 11 which is rotatable in the mechanism framework which is not shown in detail and is rotatable by means of a handle 12. The threaded shaft 11 and associated parts comprise in effect a micrometer device which makes possible accurate and readable adjustment of the support 13 and hence the container 7 in relation to the jacket of the cylinder 1.

In FIG. 4 the device is shown diagrammatically in position for applying a layer of plastic to the cylinder. The cylinder is represented as being coated with a base layer of rubber 3 on which there has also been applied one or more plastic layers 4. The plastic mass 5 of which a layer is to be applied to the cylinder is distributed on top of the cover 15 which as shown is disposed somewhat at an angle so that the plastic mass engages the surface of the cylinder.

When the cylinder 1 turns in the direction of the arrow, a fresh layer of the plastic mass 5 is applied to the cylinder through the small gap between the scraping edge of the blade 8a and the layer of plastic 4 which had already been applied to and has solidified on the cylinder. The plastic mass is distributed evenly by the blade edge 8a and the thickness of the layer being applied is accurately controlled by adjusting the blade 8a

toward or away from the cylinder by means of the threaded shaft 11. Accordingly a further layer of plastic is applied with a completely smooth surface and an exactly defined thickness. When the first layer has been completely applied to the cylinder jacket, the cover 15 is removed so that the blade 8a can smooth out any remaining uneven spots without supplying fresh plastic mass.

Finally the blade 8a is removed from the cylinder by tilting the whole container 7 upwardly and rearwardly about the shaft 10. A heating and drying device 17 disposed in the peripheral region of the cylinder 1, which can work with radiation and/or hot air, speeds up the drying and hardening of the freshly applied plastic layer.

When the drying and hardening is completed, the next synthetic layer is applied in the same way as described.

There is further shown in FIG. 4 a water bath 16 which can be put in a perpendicularly raised position as can be seen in FIG. 5, and in which the cylinder is partially immersed in the water. This water bath is used for the more rapid cooling of a layer that has been applied. In the case of water soluble synthetic resin, the water bath is used only when renewing the cover layer.

In FIG. 5 there is shown diagrammatically the position of the device in which the worn cover layer 4 of a water soluble synthetic mass is softened or already partially dissolved in the water bath 16 through which the cylinder 1 turns in the direction of the arrow. The softened cover layer is then lifted off or scraped off by the same blade 8a, which is moved successively towards the cylinder by means of the micrometer device 11, 12, 13. The plastic mass removed by the blade 8a collects in the container on the base 8 and is taken away via a discharge opening 8b optionally for further use.

EXAMPLE 1

There is described below a detailed example for the preparation of the plastic mass used and also for the advantageous applying of the first plastic layer onto the cylinder jacket in the case of the use of a plastic which is not soluble in water.

Use is made here for example of polyvinyl chloride known under the Trade name of "Hostalit P/PV 3475." Two differing initial masses A and B are produced, the first of which, A, is used at least for the formation of the first base layer and has particularly good strength whilst the other, B, is used at least for the formation of the outer cover layer which when hardened gives suppleness to the surface of the wiping cylinder and has good gliding and wear properties.

The plastic mass A is composed of 100 parts by weight of polyvinyl chloride PVC, 30 to 50 parts by weight, preferably 40 parts by weight of dioctylphthalate (DOP), 30 to 50 parts by weight, preferably 40 parts by weight, of tricresylphosphate (TCP) and 0.5 to 3 parts by weight, preferably 1 part by weight, of a stabilizer known in the trade. DOP and TCP are used as softeners.

The plastic mass B is composed of 100 parts by weight of PVC, 25 to 40 parts by weight, preferably 33 parts by weight of DOP, 15 to 30 parts by weight, preferably 22 parts by weight, of TCP, 3 to 10 parts by weight, preferably 5 parts by weight of calcium carbonate, 2 to 5 parts by weight, preferably 3 parts by weight, of graphite as a lubricant, and 0.5 to 3 parts by weight,

preferably 1 part by weight, of a stabilizer known in the trade.

The calcium carbonate contributes to increasing the wiping effect of the wiping cylinder surface on the base plate to be wiped, and the finely distributed graphite helps to improve the smooth gliding.

USE OF THE PLASTIC MASS A

For applying the first plastic base layer onto the wiping cylinder provided with a rubber jacket, the said rubber surface is roughened so that the plastic can have a good hold on the rubber surface. A rubber base layer with Shore hardness A amounting to between 40 and 90, and preferably between 70-75, is particularly suitable for the applying of the plastic layer. While the thickness of the rubber base layer can be varied, it is desirably between 0.3 mm and 4.0 mm and preferably about 1 mm. Then the wiping cylinder jacket is covered over its whole extent with a gauze strip, this being done preferably by arranging that the wiping cylinder to be treated is pressed against a pressing cylinder, and with locking of the pressing cylinder, to prevent its rotation, the cylinder to be treated is rotated, the gauze strip being inserted between the cylinders. In this way the gauze strip is wound around the cylinder to be treated smoothly, without folds or puckers. At the same time between the two cylinders, a suitable amount of the plastic solution A is poured, so that the gauze strip is completely saturated with this solution. The plastic mass here serves as adhesive by which the gauze strip is fixed onto the rubber surface. After the stripping off of the superfluous plastic mass by means of a blade such as blade 8a, FIG. 4 which produces an evenly distributed layer having a thickness of 0.3 to 1 mm, preferably of 0.8 mm and after the hardening of the plastic, there is formed a thin, even base film, in which the gauze strip is embedded.

The plastic mass when it is applied has a temperature between 20°C and 60°C, which is selected in such a way that viscosity during use is kept as low as possible. After the applying of the first base layer, the hardening out takes place at a temperature between 200°C and 250°C for at least 5 minutes, in order to obtain a good adhesion of the plastic mass, gauze strip and rubber jacket.

When preferably a mixture of nitrile and vinyl polymers is used for the rubber jacket having a Shore hardness A 70-75, no gauze strip is necessary, because such a rubber jacket produces an excellent adhesion between the rubber surface and the first PVC layer.

When a sufficient hardening of the layer is obtained, there is a delay in the putting on of the next plastic layer until the wiping cylinder surface has again cooled off to a temperature between 20°C and 60°C. For speeding up this cooling, the wiping cylinder can be immersed at least partially in a cooling water bath by raising the pan 16 as is shown diagrammatically in dotted lines in FIG. 4.

The strength of the hardened plastic layer produced from the mass A can be, for example, of Shore hardness A 60 to A 70 and preferably about A 65.

For the further plastic layers forming the midlayers, one can use optionally either the plastic mass A or B, the only thing that is important being that the plastic mass B is used at least as the last outer cover layer. The mass A can be used accordingly for the production of the further plastic layers.

After the initial treatment described, the cylinder is provided with a firmly adhering base layer and can be covered with further plastic layers, successively, preferably with the device shown in FIG. 4, the thickness of which at all times preferably lies between 0.3 and 1 mm. Each of the said layers is put on at a temperature between 20°C and 60°C and then is hardened by heating to a temperature between 150°C and 250°C, preferably to approximately to 200°C. When the hardening process is completed, the layer is again cooled to 20°C to 60°C, and here for speeding up the cooling, the water bath 16 can be used. The process cycle is repeated until the whole thickness of the layer has reached a value which differs only by at least one layer thickness from the desired total thickness, which in all can amount to 2 to 3.5 mm. For instance, four layers of plastic mass A each having a thickness of 0.8 mm are applied amounting to a total thickness of 3.2 mm. It has been found that the thickness of the individual layers and the total thickness of the layers is critical to obtain a smooth, crack-free and durable cover for the wiping cylinder.

USE OF THE PLASTIC MASS B

For the outer cover layer or layers, as already mentioned, the plastic mass B is used. The application of the outer cover layer differs from the treatment of the inner layers, in that for the hardening of this outermost layer, preferably an increased temperature in the range of 200°C to 250°C is used e.g. 200°C, in order to obtain good hardness of the said layer, which is subjected to stress during the subsequent wiping process in the printing process. All other layers are heated to approximately 200°C. Whilst the strength of the hardened inner layers produced from the mass A, as indicated, would correspond to approximately Shore hardness A 65, for the strength of the cover layer produced from the mass B one preferably selects a strength which corresponds to Shore hardness A 80 to A 95 and preferably A 90. The thickness of the outer layer or layers of the plastic mass B is likewise between 0.3 and 1 mm. If a single layer of plastic mass B having a thickness of 0.8 mm is applied over four layers of plastic mass A each having a thickness of 0.8 mm, the total thickness is 4 mm.

If after a certain amount of use of the wiping cylinder in the printing process the cover layer shows a certain amount of wear and tear, this cover layer can be renewed by removing it initially mechanically for example by means of a lathe tool on a lathe, down to a depth at which all cracks, damaged areas and uneven places are done away with. Thereupon the said cover layer, which has been removed mechanically in this way is replaced by a new plastic layer of the mass B, which is then brought to a temperature between 20°C and 60°C and then is hardened at a temperature between 200°C and 250°C.

The point of time of the completed hardening out can easily be recognized with the use of Solvic PVC, as the plastic layer takes on a transparent appearance.

EXAMPLE 2

As second example will be described the production of plastic masses from a water soluble resin, and also the applying of this plastic mass. For this purpose use is made of three polyvinyl alcohol types which are customary in the trade, i.e., Mowiol 30 to 88, Mowiol 50

to 88 and Mowiol 70 to 88, which are partially saponified, and are polyvinyl alcohols containing acetyl groups. The first figure in the type designation characterises the length of the molecule chain and accordingly the relative polymerization degree of the polyvinyl acetate used; the second figure of the type designation indicates the degree of saponification.

To produce the solution A for the base layer; one mixes 150g Mowiol 30 to 88, 150g Mowiol 50 to 88 and 900g Mowiol 70 to 88.

To this power mixture is added approximately 300g ethyl alcohol. For this, use is made for example of "Halethyl PCB" 1002, which is a compound of 20 parts by weight of ethyl alcohol, 30 parts by weight of methylethyl-ketone and 50 parts by weight of ether. The resulting swelling paste is ground fine to a thoroughly homogenous mass, to which is then added approximately 510 parts by weight of hot water which is near its boiling point. Still maintaining the temperature, the resulting solution is thoroughly homogenized. The said homogenous solution then has added to it approximately 30 parts by weight of glycerine of pharmaceutical quality.

The thus prepared solution is filtered, and the resulting filtrate changes after the cooling into a mass which remain viscous and which is ready for applying. At room temperature the useful life of this mass is 3 to 5 days till it is dried and hardened to the extent that it requires a further treatment for reuse.

Production of the solution B for the cover layer: approximately 1.5 litres of the above described solution A is heated in a water bath to approximately 80°C. This heated solution has added to it approximately 50 ml of chalk white (calcium carbonate CaCO_3) which previously has been suspended in a small amount of cold water to form a homogeneous paste.

After thorough mixing, the said solution has added to it approximately 10 ml of tannic acid which was previously dissolved in a small amount of hot water. After cooling, the solution B produced in this way is ready for applying.

Additionally or in place of the chalk white mentioned, the solution A—as in the case of the PVC—can also have added to it an equal amount of graphite which was previously suspended in a small amount of alcohol, with the formation of a homogeneous paste.

APPLYING THE PLASTIC MASSES A AND B

The applying of the first plastic base layer using a gauze strip, onto the roughened rubber jacket of the cylinder corresponds to the process step described for PVC. The mass, however, in this case is applied at room temperature, whilst the subsequent hardening out needs to take place only at moderate temperatures. The hardening is carried out to provide a Shore hardness of A 60 to A 70 and preferably about A 65.

The separate layer thicknesses are only 0.1 to 0.3 mm and the total thickness is selected at 1 to 2 mm. If one wishes to obtain a total layer thickness of 2 mm and one assumes that the said base layer has a thickness of 0.2 mm, then by means of the device of FIG. 4 for example eight layers are applied in sequence of 0.15 mm each, using the plastic solution A. Before the applying of the subsequent layer, the last layer must always be well dried and hardened.

For producing the cover layer areas, one uses the above mentioned solution B in place of the solution A.

In the case considered, four further plastic layers each 0.15 mm thick of the plastic mass B are applied and each layer is dried and hardened before applying a succeeding layer. The cover layers should have a hardness greater than the under layer or layers, for example a Shore hardness between A 80 and A 95 and preferably about A 90.

Naturally the thickness of the cover layer which is produced from the plastic mass B can be varied at will; all that is needed is simply that the number of the layers produced from solution A and from solution B must form the total combination required.

In the dimensioning of the thickness of the separate plastic layers or of the dimensioning of the total thickness, in the case of Mowiol, one has to take into account the shrinking effect of the plastic mass. The shrinking is also the reason why one applies one at a time only comparatively thin layers. If one were to apply too great layer thicknesses all at once there would be the danger that during the hardening the layer would show unevenness or even cracks, as a result of the shrinking.

For the renewing of a used cover layer all that has to be done is to immerse the cylinder in a water bath and to soften or dissolve the cover layer with simultaneous stripping off or scratching off by means of the blade 8a, as in FIG. 5. When the drying is completed, one or more fresh surface layers are put on, as described, using the solution B.

EXAMPLE 3

The plastic material utilized is a polyvinyl chloride which lends itself particularly well to the formation of mixtures with plasticizers. These mixtures are commonly called "Plastisol."

The Pastisol is a liquid characterized by a certain viscosity which is greater when the content of the plasticizers is smaller. When the Plastisol is heated, the viscosity at first decreases (at a temperature of 40°–50° C.) then at about 60° there is a very rapid increase of the viscosity and the mass becomes solid, attaining a stage called "pre-gelatinization." The compact mass thus obtained is friable and has a very low mechanical strength. When the heating is continued to about 180°–200° C. there is obtained a complete "gelatinization" and after cooling it results in a material resembling rubber which is insensible to water, aqueous solutions, acids and alkalies, alcohol and hydrocarbons. This material is characterized by a very high mechanical strength and the Shore hardness of the final product is a function of the type and the quantity of the plasticizer used. For covering wiping cylinders for use with water, there is used a Plastisol, the characteristics of which permit obtaining not only a good coating (for which the viscosity should not be too high) but also the desired qualities of the final product (hardness, mechanical strength, characteristics of the coating, etc.).

The products used to obtain this effect are as follows:

1. Polyvinyl Chloride (PVC): "Hostalite P/VP-3475" made by Hoechst AG Frankfurt, West Germany. This is a white powder obtained by the polymerization in emulsion of vinyl chloride. The form and size of the molecules are such as to provide very fluid Plastisol. While the powder is not hygroscopic, it is advisable to store it in closed vessels.

2. Trioctyl-phosphate (TOP):

This plasticizer is manufactured by the Bayer Company.

3. Dioctyle-sebacate (DOS):

This plasticizer is supplied by the Swiss Company OelChemie.

4. Plastolein 9789:

This polymeric plasticizer is supplied by the Unilever Company, Emery, Holland.

5. Stabilizer:

During the rapid heating necessary to effect gelatinization, the PVC has a tendency to degrade by producing hydrochloric acid while the color changes from white to yellow to brown and to black. This inconvenience is completely eliminated by the addition of stabilizers. A suitable stabilizer for this purpose is the tin base PROSPER-DBM supplied by the Commer Company.

6. Additives:

Calcium carbonate and graphite. These additives contribute to modifying the characteristics of the final product to improve its wiping quality and to reduce the coefficient of friction.

Preparation of the plastisol:

The different components should be perfectly dispersed in the mixture which should be absolutely free of air bubbles and moisture. For this purpose it is desirable to use a planetary mixer which working under vacuum effects the mixing, the extraction of air and the elimination of moisture. The different phases of the operation are as follows:

1. The several components are placed in the mixing vessel according to the proportions indicated below.

2. The mixer is put into operation for 30 minutes and the vacuum pump is then put into operation. At first, the mass swells and becomes frothy. The air discharge valve is eventually opened slowly while the mass is observed through a porthole to prevent the froth reaching the upper part of the vessel. After some minutes, the valve can be completely closed, whereupon the mixer is continued in operation for at least 1 hour.

3. The mixer is stopped while opening the air valve with caution and then the mass is filtered through a bronze screen into a second mixing vessel.

4. The blades are thoroughly cleaned and the mass is again mixed under vacuum, the vacuum pump being maintained this time in operation until bubbles of air are practically eliminated.

5. The mixer is stopped, the air valve is opened with caution and finally the vacuum pump is stopped.

The Plastisol is then ready to be applied to the cylinder. It is recommended that a freshly prepared batch be used (within 24 hours) because in time the viscosity increases and coating becomes more difficult.

Preparation of the Surface of the Rubber:

It is very important for the surface of the rubber to be prepared before the application of the plastic mass in such manner as to assure a perfect bonding of the plastic on the rubber. The necessary operations are as follows:

1. The cylinder to be coated is placed on the coating machine, the heating hood is lowered and the cylinder is turned at a speed of five revolutions per minute and heated for 30 minutes (all of the central resistances being put into operation during the last 20 minutes). The heating is then discontinued and the cylinder is allowed to cool while continuing to rotate for a quarter of an hour.

2. While rotating the cylinder it is again heated for 20 minutes (using all of the resistances during the first 10 minutes and then only the central resistances during the last 10 minutes). Heating is then discontinued for 15 minutes and resumed for another 20 minutes (10 plus 10 minutes).

3. The cylinder is then cooled with water, wiped dry and the surface of the cylinder is very carefully and uniformly treated with emery paper in order to eliminate all residual oil or grease from the surface of the rubber. The entire surface as thus treated should have a black color.

4. The cylinder is carefully brushed to totally eliminate the particles rubber, is wet with water and is dried with a rubber cloth (which cannot leave any residue).

5. The cylinder is again heated for 15 minutes (10 plus 5 minutes) and then allowed to cool without turning until it reaches a temperature of about 40°C. The cylinder is then ready for application of the first coat of plastic.

Application of the Plastic

First Coat

The Plastisol has the following composition:

"Hostalite P/VP-3475"	1000 gr.
Trioctyle-phosphate (TOP)	240 gr.
Dioctyle-sebacate (DOS)	120 gr.
Graphite	15 gr.
Calcium carbonate	15 gr.
Prosper DBM	10 gr.

The speed of the cylinder is regulated to 5 revolutions per minute. When the cylinder is cold it is heated several minutes until the surface attains a temperature of about 40° C.

With the cylinder stopped, the blade and the counter-blade are brought in toward the cylinder in such manner that they barely touch the surface of the cylinder without pressure. A small quantity of the Plastisol is then spread along the whole length of the blade above the line of contact between the blade and the cylinder. The cylinder is then put in rotation and after one complete turn the blade is slowly withdrawn so that a thin coating (0.1 – 0.2 millimeters) is applied over the entire surface of the cylinder. After removing the blade, the cylinder is allowed to rotate cold for several minutes and then the heating hood is lowered and heat is applied for 23 minutes (using all of the resistances during the first 8 minutes and then only the central resistances during the last 15 minutes). The heat is then turned off but the heating hood is left in its lower position several minutes. Then it is raised and the cylinder is cooled with water to a temperature of about 40° C. The cylinder is then wiped dry, washed with ordinary alcohol, and when the surface is perfectly dry, it is ready to receive a second coating. Additional coatings of the same composition may be applied in like manner but at least the outer coating is of a different composition as described below.

60 Outer Coating

A Plastisol having the following composition is utilized:

"Hostalite P/VP-3475"	1500 gr.
Trioctyle-phosphate (TOP)	360 gr.
Dioctyle-sebacate (DOS)	180 gr.
Plastolein 9789	150 gr.
Graphite	45 gr.

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Calcium carbonate	45 gr.
Prosper DBM	15 gr.

The procedure is the same as for the first coating while using a somewhat larger quantity (about 450 cc.). During application of the plastic, the blades are withdrawn until almost the entire amount of plastic has been applied to the cylinder — a small quantity of plastic, however, remaining on the blade. The curing, cooling with water, washing with alcohol and the drying are effected as for the first layer.

The operation of coating is repeated until the diameter of the cylinder exceeds 266 millimeters. At the beginning of each coating the cylinder should have a temperature of about 40°C. In the case where the cylinder is cold it is necessary to heat it several minutes tubing the surface to this temperature.

Rectifying and Polishing

Experience has shown that it is rarely possible to obtain a perfectly cylindrical layer of plastic by coating. To overcome this inconvenience there has been provided a machine for truing the plastic coated cylinder. After the last layer has been applied it is advisable to let the cylinder sit at least over night before proceeding with the truing. The truing operation is carried out with the cylinder dry and comprises rotating the cylinder while removing any high portions by a cutting tool or abrasive. One or more operations are required according to the initial amplitude of the irregularities. After the cylinder has been trued, it is moistened with water and polished with an extremely fine emery paper until the surface is perfectly smooth and uniform.

Regeneration of the Coated Cylinders

When a coated cylinder is to be renewed, it is necessary first of all to true it until all of the surface irregularities have disappeared. Then its diameter is checked. When the diameter is greater than 264 millimeters the cylinder can be polished and reused.

On the contrary if the diameter is found to be too small, it will be necessary to apply one or more layers of plastic and to true and polish the surface when the diameter has been brought anew to 265 millimeters.

In a case where after rectification small cavities appear on the surface of the plastic (indicating a decomposition of the plastic) it will be necessary to proceed with the rectification until the basic layer of rubber is reached whereupon all of the coating operations are repeated as described above.

The following is the list of chemicals and supplies required:

	Suppliers
Polyvinyl chloride	Farbwerke Hoechst
"Hostalite P/VP-3475"	or Ormag
Diocetyl-sebacate (DOS)	Oel-Chemie or Ormag
Triocetyl-phosphate (TOP)	Bayer or Ormag
Plastolein 9789**	UNILEVER, Emery or Ormag
PVC Stabilizer PROSPER DBM	Commer or Ormag
Calcium Carbonate	Ormag
Graphite	Ormag
Alcohol	Local
Brush	Local
Emery Pater - Coarse grain and Fine grain	Ormag or Local
List of Equipment and Accessories Required:	
	Suppliers

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	Suppliers
Planetary Mixer with vacuum pump	Ormag
Special Plastic Coating Machine with Heating Hood and Ventilator for drawing off the vapors	Ormag
Set of seven special receptacles for the plastic mass with small devices for retouching	Ormag
Five meters of metal cloth (bronze screen) with stainless steel frame for filtering the mixture	Ormag
Mobile crane for introducing the wiping cylinders into the coating machine	Ormag
Machine for rectifying or truing the plastic coated cylinders	Rastelli
Polishing equipment	Ormag

*Emulsion polymerized PVC.
**High molecular weight polymer plasticizer and tackifier based on dibasic fatty alcohols and acids.

The above-described arrangements for the production of the plastic masses to be applied are naturally given as examples only and are to be evaluated as such; the process of the invention can be carried out with other synthetic plastic which are or are not soluble in water, and similar in their properties to PVC or to the polyvinyl alcohols, and here naturally also the constituents of the given mixtures can be varied in type and amount.

What I claim and desire to secure by Letters Patent is:

1. A method of making a wiping cylinder of a steel engraving press which comprises providing a base cylinder, covering said base cylinder with a thin layer of rubber, providing a first homogeneous mixture composed of 100 parts by weight of polyvinyl chloride, 30-50 parts by weight of dioctylphthalate, 30-50 parts by weight of tricresylphosphate and 0.5 to 3 parts by weight of a stabilizer; providing a second homogeneous mixture composed of 100 parts by weight of polyvinyl chloride, 25-40 parts by weight of dioctylphthalate, 15-30 parts by weight of tricresylphosphate, 3-10 parts by weight of CaCO₃, 2-5 parts by weight of graphite and 0.5-3 parts by weight of a stabilizer; initially coating said rubber covering with an initial seamless layer of said first homogeneous mixture having a uniform thickness of from 0.3 to 1 mm; then coating said layer with a plurality of intermediate seamless layers each composed of one of said first and second homogeneous mixtures and each having a uniform thickness of from 0.3 to 1 mm. until a composite coating including said first mentioned layer having a uniform total thickness of from 2 to 3.5 mm. is obtained; and finally coating said composite coating with a final seamless layer of said second homogeneous mixture having a uniform thickness of from 0.3 to 1 mm to provide a smooth cylindrical surface precisely concentric with the axis of rotation of said wiping cylinder, each of said layers being heat hardened before an overlying layer is applied, said layers of said first mixture being hardened in situ to a hardness of approximately Shore A 60 to 70 and said final layer being hardened in situ to a hardness of approximately Shore A 80 to 95.

2. A method according to claim 1, wherein said initial and final coating steps each include heat treating the formed layer within a temperature range of from 200°C-250°C to effect hardening of the layer; and wherein intermediate coating steps each include heat treating the formed layer within a temperature range of from 150°-200°C to effect hardening of the layer, said

hardening of said initial layer and each intermediate layer being effected before the next layer is applied.

3. A method according to claim 1, wherein said initial coating step comprises applying said layer of said first homogeneous mixture to said rubber covering at a temperature of from 20°C to 60°C, heat treating the applied layer for at least 5 minutes at a temperature of from 200°C to 250°C, and cooling the heat treated layer back down to a temperature of from 20°C to 60°C by immersing same in a water bath.

4. A method according to claim 1, including the steps of roughening the surface of said rubber covering before said initial coating step and thereafter applying over the roughened surface of said rubber covering a gauge strip saturated with said first homogeneous mixture, removing any excess of said first mixture to produce an evenly distributed layer having a thickness of 0.3 to 1 mm and then hardening said layer to form a thin even base film in which said gauge strip is embedded.

5. A method according to claim 2, including the step of cooling said initial layer and each said intermediate layer to a temperature of 20°C to 60°C after said heat treating and before the next layer is applied.

6. A method according to claim 1, wherein each of said layers is applied by rotating said cylinder with its axis horizontal and with its periphery precisely and uniformly spaced from a horizontal stright blade parallel to the axis of said cylinder and extending the full length of said cylinder and supplying said homogeneous mixture to an upper face of said blade throughout its length, said cylinder being rotated in a direction to cause its periphery to move downwardly past said blade.

7. A method according to claim 6, wherein the supply of said homogeneous mixture is discontinued after a sufficient quantity of said mixture has been supplied to form a layer on said cylinder, whereupon rotation of said cylinder is continued with said blade in place to remove any excess mixture and assure formation of a uniform layer of predetermined thickness.

8. A method according to claim 7, wherein rotation of said cylinder is continued after formation of each said layer while applying to said cylinder simultaneously throughout its length radiant heat to effect hardening of said layer.

9. A method according to claim 8, wherein said application of heat is discontinued after sufficient heat has been applied to harden said layer and rotation of said cylinder is continued while applying to said cylinder throughout its length a cooling fluid to reduce the temperature of said layer.

10. A method according to claim 6, in which said blade is first brought into engagement with said cylinder throughout the length of the cylinder and is then retracted a predetermined distance to apply a uniform layer of material of specified thickness.

11. A method according to claim 1, wherein the proportion of the constituents of said first and second homogeneous mixtures are by weight approximately as follows:

first homogeneous mixture.	
polyvinyl chloride	100 parts
dioctylphthalate	40 parts
tricresylphosphate	40 parts
stabilizer	1 part

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second homogeneous mixture.	
polyvinyl chloride	100 parts
dioctylphthalate	33 parts
tricresylphosphate	22 parts
CaCO ₃	5 parts
stabilizer	1 part

12. A method according to claim 1, wherein said layer of rubber is 0.3 to 4 mm thick and is cured to a hardness of approximately Shore A 40 to 90.

13. A method according to claim 1, wherein said rubber layer is composed of a mixture of nitrite and vinyl polymers having a hardness of approximately Shore A 70 to 75.

14. A method according to claim 1, wherein each layer of said first homogeneous mixture other than the initial layer is hardened to a hardness of approximately Shore A 60 to 70.

15. A method of making a wiping cylinder of a steel engraving press which comprises providing a base cylinder covering said base cylinder with a layer of rubber, providing a first homogeneous filtered mixture composed of 150 g. of 30-88 polyvinyl alcohol, 150 g. of 50-88 polyvinyl alcohol and 900 g. of 70-88 polyvinyl alcohol wherein the first number of each polyvinyl alcohol designation indicates the relative length of the molecule chains and the second number indicates the degree of saponification, 300 g. of ethyl alcohol, 510 parts by weight of water and 30 parts by weight of glycerine; providing a second homogeneous mixture composed of 1.5l of said first homogeneous mixture, 50ml of CaCO₃ and 10ml of tannic acid; coating said rubber covering with a plurality of layers each composed of said first homogeneous filtered mixture and each having a thickness of from 0.1 to 0.3 mm; and finally coating the last applied layer of said plurality of layers with a number of layers of said second homogeneous mixture to obtain a composite coating including said plurality of layers having a total thickness of from 1 to 2 mm, each of said layers being heat hardened before an overlying layer is applied.

16. A method of making a wiping cylinder of a steel engraving press which comprises providing a base cylinder, covering said base cylinder with a layer of rubber, providing a first homogeneous mixture having the following composition:

Parts by weight	
Emulsion polymerized PVC	1000
Triocetyl-phosphate (TOP)	240
Dioctyle-sebacate (DOS)	120
Graphite	15
Calcium carbonate	15
PVC Stabilizer	10

providing a second homogeneous mixture having the following composition:

Parts by weight	
Emulsion polymerized PVC	1500
Triocetyl-phosphate (TOP)	360
Dioctyle-sebacate (DOS)	180
High molecular weight polymer plasticizer and tackifier based on dibasic fatty alcohols and acids	150
Graphite	45
Calcium carbonate	45
PVC Stabilizer	15

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initially coating said rubber covering with an initial layer of said first homogeneous mixture having a uniform thickness of from 0.1 to 0.2 mm; then coating said cylinder with a plurality of successive layers each compound of one of said first or second compositions and each having a thickness of from 0.1 to 1.0 mm until a coating including said initial coating having a total thickness of 1 to 4 mm is obtained and finally coating said cylinder with a final layer of said second composition having a thickness of from 0.1 to 1 mm, each of said layers being heat set before the overlying layer is applied.

17. A method according to claim 16, including the further step of truing said cylinder after said final coat-

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ing has been applied and said cylinder has set about 12 hours to stabilize said coatings.

18. A method according to claim 15, wherein each layer of the first homogeneous mixture is hardened to a hardness of Shore A 60 to 70 and each layer of the second homogeneous mixture is hardened to a hardness of Shore A 80 to 95.

19. A method according to claim 18, wherein each layer of the second homogeneous mixture has a thickness of about 0.15 mm.

20. A method according to claim 7, wherein each layer of said first homogeneous mixture has a thickness of 0.1 to 0.2 mm.

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