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PRINTING MACHINE PRESSURE CYLINDER

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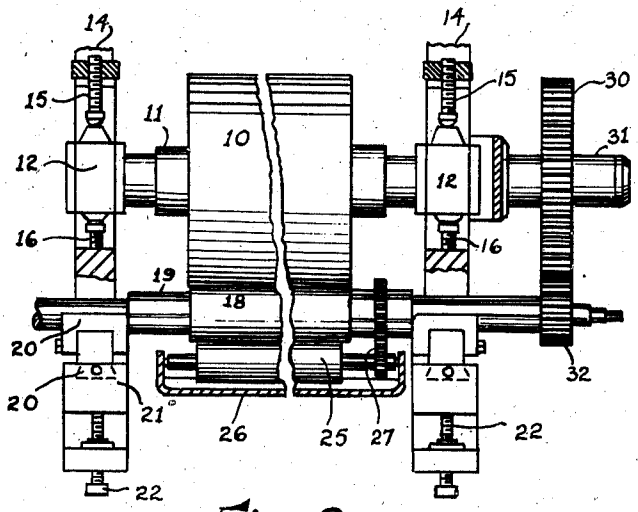


Fig. 2

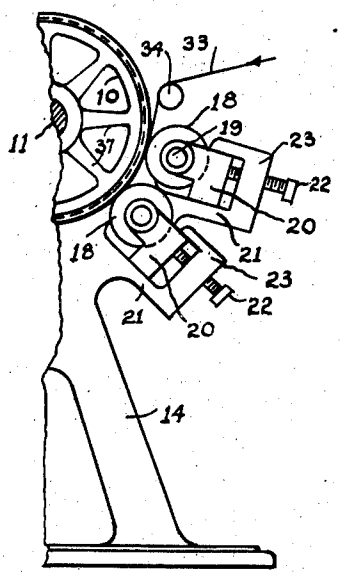


Fig. 3

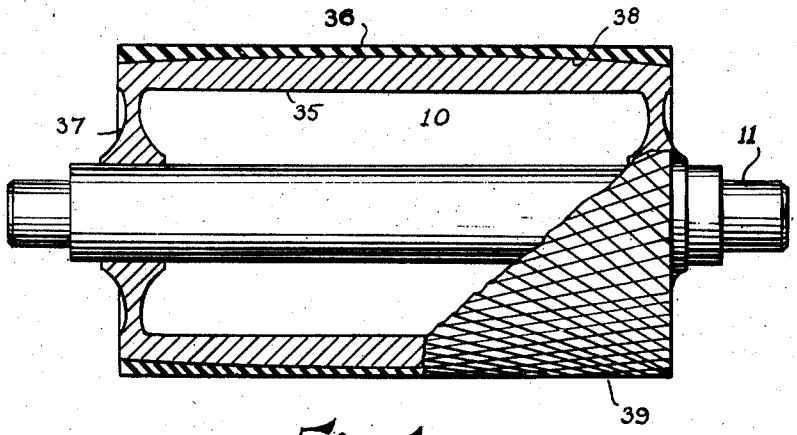


Fig. 1

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PRINTING MACHINE PRESSURE CYLINDER

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1 Claim. (Cl. 101—407)

This invention relates to printing apparatus and more particularly to the construction of the backing or pressure cylinder of a textile printing machine which holds the fabric against the pressure of the printing roll.

A standard type of textile printing machine comprises a large freely rotatable backing roll or cylinder having one or a plurality of printing rolls arranged to contact with the periphery thereof and forming a printing couple between which the fabric is printed. The printing rolls are driven by power mechanism and the backing cylinder is rotated by the frictional contact of the printing rolls against the fabric and the associated back gray cloth and rubber blanket, if used, which pass between the backing cylinder and the rolls. The printing roll mandrel is moved by means of pressure screws at its opposite ends which adjust the pressure applied to the fabric, and this pressure may vary from 1 to 9 or more tons at each end. The printing roll may be several feet long, and the enormous pressure applied at each end thereof may cause the roll to bend slightly during the printing operation; so that if proper provision were not made, the printing roll would press heavily against the fabric adjacent the ends of a cylindrical non-elastic backing roll and would press lightly or not at all at the middle portion of the fabric. Also, if the backing roll is small in diameter and mounted on a light mandrel, it too may be bent by the printing pressure with the same general results.

It has, therefore, been customary to apply a thick layer of woolen or linen padding or lapping on the backing roll or cylinder in such a way as to form a slightly convex surface which fits the line of contact of the printing roll and insures proper engagement between the fabric to be printed and the entire length of the engraved surface of the printing roll. This cloth lapping must be laid on the cylinder by a highly skilled expert, and each operator has his own ideas as to how this should be done for a given type of printing and there is no uniformity of construction. Moreover, the lapping cloth must be used in large and costly amounts and it wears out comparatively quickly, so that the machine is frequently out of commission for considerable periods as required for replacing the lapping; hence this type of construction has proven to be inefficient and expensive.

It has been proposed to utilize a crowned rubber roll in place of that linen covered backing cylinder. That is, a cylindrical metal drum has been covered with a layer of rubber which has its middle portion thicker than the edge portions so as to form a crowned convex surface. The enormous pressure of the printing roll against this central thickened portion of the rubber layer tends to cause the rubber to bunch up in advance of the printing roll and to move laterally, and this may result in the fabric wandering irregularly and not tracking properly with the printing roll. Also, if a straight cylindrical iron cylinder were provided with a layer of rubber of uniform thickness, this plain cylindrical surface would compress improperly under the printing pressure and not give the same contact at the middle portion as adjacent the edges of the printing roll. The rubber layer should be deformed or compressed slightly under the printing pressure to provide a slightly convex narrow band of printing contact but, whatever may be the shape of the supporting roll, a layer of rubber which will be thus deformed will tend to flow and cause the fabric to wander. Moreover, the fabric being printed may be mislead or not be held in proper registry with the printing pattern if the surface of the cylinder roll is smooth and does not provide sufficient frictional engagement with the fabric.

The primary object of this invention is to overcome such problems and to provide a textile printing apparatus in which the backing cylinder is so constructed and shaped that proper pressure will be applied to the fabric being printed throughout its entire width and the fabric will be printed satisfactorily and prevented from wandering materially out of registry with the printing pattern. Further objects will be apparent in the following disclosure.

In accordance with my invention I have found that a satisfactory printing operation may be had if the backing or pressure cylinder of the printing couple is a composite body having a crowned convex surface carrying secured thereto a deformable elastic layer of a vulcanized rubber compound containing a reinforcing, flow resisting and anti-slipping material therein which permits a limited flow deformation of the layer under a normal printing pressure.

Referring to the drawing, which illustrates one embodiment of this invention utilized in a textile printing machine:

Fig. 1 is a vertical elevation, partly in section, of a preferred form of backing cylinder;

Fig. 2 is a fragmentary and somewhat diagrammatic front elevation of a portion of the textile printing machine carrying this backing

cylinder associated with one of a plurality of printing rolls; and

Fig. 3 is a fragmentary end view of the machine of Fig. 2.

A textile printing machine of standard construction comprises a large backing cylinder **10** supported on a shaft or mandrel **11** which has its ends mounted in suitable bearings **12** arranged for free rotation of the cylinder. The bearings may be adjustably mounted in any suitable manner on the two parallel spaced side frames **14** of the machine. The adjustment may be effected by means of the two screws **15** and **16** suitably threaded in the frame which movably engage the housings of the bearings **12**. The other member of the printing couple is a printing roll **18** which is usually made of an engraved copper sleeve removably fitted onto a mandrel **19**. The machine may be provided with a plurality of these printing rolls. The ends of the mandrel **19** are suitably carried in bearing housings **20** slidably mounted on the slide arms **21** which are formed as a part of the side frames **14**. Pressure screws **22** threaded through portions **23** of the frame carrying the slideways are arranged to move the ends of the mandrel to force the printing roll **18** against the cylinder **10** under high pressure. An inking roll **25** suitably mounted in an ink receptacle **26** is driven by means of a pair of gears **27** suitably mounted on the printing roll and the shaft of the inking roll. The printing rolls are normally driven in synchronism by means of the large bull gear **30** mounted on a short shaft **31** suitably mounted on one of the side frames **14** and this gear engages the further gear **32** on the end of each printing roll mandrel. The fabric **33** to be printed is conducted over a guiding roller **34** into the printing zone defined by the printing rolls and the backing cylinder and it is drawn forward, either alone or with a back gray cloth and/or blanket, by the frictional force of the positively driven printing rolls. Numerous other constructional features may be employed, as is well understood in the industry.

In accordance with this invention, I have provided a backing cylinder which may be used with a plurality of printing rolls or which is arranged to receive the pressure of a single printing roll, such as is found in a printing machine having a separate backing cylinder for each of a plurality of printing rolls. As shown in Fig. 1, this backing cylinder may comprise a rigid supporting drum or roll **35** made of metal or other suitable material which carries a layer **36** of elastic material on its peripheral surface. A preferred construction is one in which a hollow substantially cylindrical metal drum **35** is mounted on spaced spiders **37** which in turn have their hubs suitably secured on the supporting shaft or mandrel **11**. The metal drum or roll **35** is shaped to provide a slightly crowned convex or barrel shaped outer peripheral surface **38**. For example, an iron cylinder may be turned in a lathe to provide a diameter of 29.931 inches at the central portion which tapers to a diameter of 29.875 inches adjacent its edges, thus providing a crown of 0.056 inch. The crown may be varied widely in accordance with desired printing operations, and particularly depending upon the curve of the line of contact of the printing roll with the backing cylinder which is developed by the pressure that will normally be applied to that printing roll. The surface **38** may be shaped to fit geometrically the contact line of the bent printing roll or any other desired curvature may be applied thereto. The printing roll bends only a slight amount and the surface **38**, as will be understood, need not fit or correspond with that curvature, because of the resiliency or elasticity and deformability of the elastic layer **36**.

The outer layer **36** is made of a suitable elastic medium, and preferably a vulcanized rubber or a synthetic substitute therefor. This rubber layer is preferably made as thin as is feasible for the required printing operation since a thick rubber layer tends to bunch up in advance of the printing roll. For example, this rubber layer may be approximately ⅜ inch thick. Various types of rubber or other elastic medium may be employed within the knowledge of one skilled in the art, but I preferably use a vulcanized rubber which measures from 5 to 8 on the plastometer scale. The rubber layer may also be provided with reinforcing strengthening material which resists the tendency for the rubber to flow or which forms a roughened surface, such as may be provided by incorporating therein fibrous material, such as cotton or woolen fibres. These fibres are preferably short and small in size, and their main purpose is to give greater strength to the elastic layer of rubber and prevent its flowing or bunching up materially in advance of the pressure roll. Also, the exposed fibres tend to make the surface of the rubber rougher and aid in preventing slippage of the endless rubber blanket that normally travels with the fabric through the printing zone. This rubber layer may however be provided with a knurled surface **39** or other type of roughened surface for the same purpose. A preferred rubber layer having cotton fibres therein is made approximately ⅜'' thick and has a plastometer reading of from 5 to 10. I, however, may use much harder rubber, such as ebonite, or other suitable medium having a plastometer reading of 2 or as desired. A wide variation may be made in the type of elastic material that is applied to the backing cylinder as will be understood. It may be also noted that the iron cylinder is preferably given its crown shape by being turned on a lathe which leaves comparatively coarse marks thereon, which aid in holding the rubber layer in place. This rubber may be vulcanized on the iron backing cylinder so as to make an integral union therewith.

The rubber layer is preferably provided with a substantially cylindrical surface on its outer side. This insures proper contact with the fabric to be printed where the pressure is so light as not to deform the printing roll or backing cylinder surface. That is, if the printing roll provides a straight line contact, the rubber layer of the backing cylinder likewise provides a parallel straight line contact and the two meet properly throughout the entire width of the fabric. If on the other hand, the printing roll is forced under an enormous pressure against the backing cylinder sufficient to bend one of the parts, then that pressure will deform the outer portions of the rubber layer and provide a wide concave band of contact between the fabric and the printing roll. This is particularly desirable where the engraving is fine and heavy pressure is needed to force the cloth into intimate contact with the recessed portions of the engraving. In that case, the rubber layer squeezes under that pressure to contact fully with the printing roll. The rubber layer may be shaped to provide a convex crowned surface, which may correspond with the crown on the iron drum and thus provide sub-

stantially the same thickness of rubber throughout the entire line of pressure. The rubber layer may be provided with any other desired surface shape; but it is preferred that it have a substantially true cylindrical surface as above explained, so that its outer or edge portions provide a thicker elastic layer or a longer spring, as it were, than is found at the central portion of the cylinder and so aids in making a satisfactory contact between the fabric and the printing roll.

By this construction I compensate for any variations in the shape of the printing roll or cylinder due to the bending of its mandrel and insure that the pressure against the fabric is either equalized throughout its width or so controlled as to insure a proper printing contact. Also, the rubber layer has other desirable qualities in that it leaves no printing marks on the fabric, such as is sometimes caused by the overlapped end of the cloth wrapped on the roll. The rubber surface may be made smooth or it may be made rough by knurling or by the inclusion of asbestos, cloth or other fibrous material or otherwise shaped as desired. Many other advantages will be apparent to one skilled in this art.

Since many modifications may be made in the construction as will now be appreciated by one skilled in the art, it is to be understood that the above description is to be interpreted as illustrating the general principles of my invention and the preferred embodiments thereof and not as imposing limitations on the scope of the claim appended hereto.

I claim:

A backing cylinder associated with the printing roll in a textile printing machine comprising a rigid support provided with a convex crowned surface and an elastic deformable layer secured thereto which has a substantially cylindrical peripheral surface, said layer comprising a vulcanized rubber compound containing separate, short, reinforcing fibres incorporated therein, said rubber compound having a plastometer reading of from 5 to 10 and an elasticity which permits its surface to deform into a narrow concave band of contact between a fabric being printed and the printing roll under a normal pressure load, and the fibres forming a rough anti-slipping surface and reinforcing the rubber and limiting its flow while permitting deformation thereof.

JOHN HAROLD MAY.