March 16, 1937. R. C. BENNER ET AL 2,073,918

TYMPAN SHEET

Filed July 13, 1932

Fig. 1.

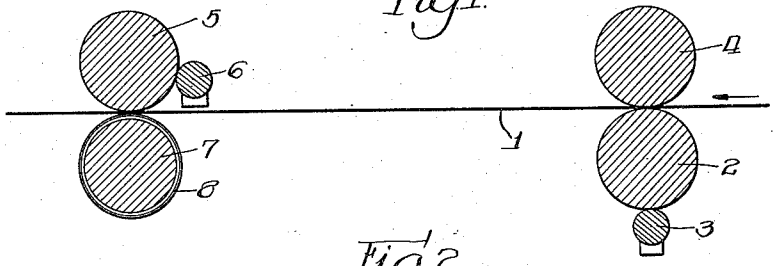


Fig. 2.

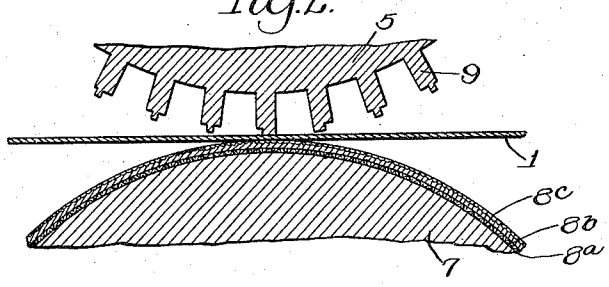


Fig. 3.

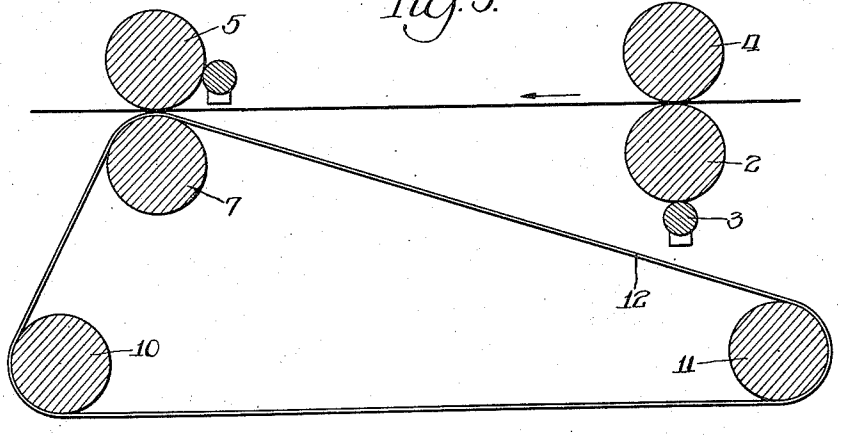
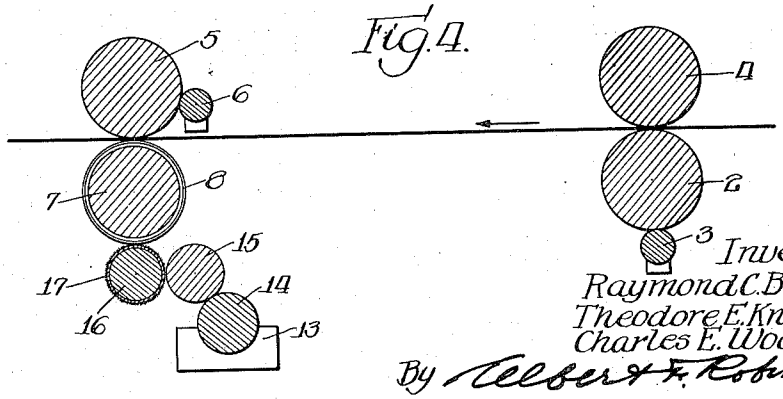


Fig. 4.



Inventors,
Raymond C. Benner.
Theodore E. Knowlton,
Charles E. Wooddell.
By Tolbert & Robinson Atty.

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2,073,918

TYMPAN SHEET

Raymond C. Benner, Niagara Falls, Theodore E. Knowlton, New York, and Charles E. Wooddell, Niagara Falls, N. Y.; said Benner and said Wooddell assignors to said Knowlton

Application July 13, 1932, Serial No. 622,296

15 Claims. (Cl. 154—54.5)

This invention relates to improvements in printing, pertaining particularly to the printing of both sides of a blank sheet concomitantly without blurring or smearing the undried ink on the side of the sheet which is first printed.

One of the objects of the invention is to produce an improved type of coating to be used on the impression or tympan roll which is the roll used to support the blank sheet being printed and especially the coating used on the second tympan roll or that roll which comes into contact with the side of the paper which has first been printed. This coating is commonly referred to as "tympan paper".

The invention consists in the novel construction and character of a tympan sheet hereinafter described or claimed for carrying out the above stated object and such other objects as will hereinafter appear.

For a better understanding of the invention reference may be made to the accompanying drawing in which:

Figure 1 is a view in vertical sectional elevation of that part of a printing apparatus embodying my invention;

Figure 2 is an enlarged detailed view of part of two rolls particularly concerned with the invention, and

Figures 3 and 4 are other modifications.

Referring to the drawing, numeral 1 represents a blank sheet or web, such as paper, which is fed in the direction of the arrow from a supply roll (not shown) between the print roll 2, inked by means of the ink roll 3, and the first tympan or impression roll 4. The paper, now printed on its lower side, is then fed between a second print roll 5, similarly inked by ink roll 6, and a second tympan or impression roll 7. This second tympan or impression roll is faced with tympan paper 8, comprising a base of paper, fabric 8^a, or the like, to which a coating 8^b, hereinafter described is applied and has partially embedded therein granules 8^c.

The enlarged view of Figure 2 in which 9 represents the type illustrates more clearly that part of the printing process with which the invention is concerned and will be discussed more fully later.

In Figure 3 is shown a modification whereby the tympan paper is used in the form of a belt 12 which passes around the tympan roll 7 and two idler rolls 10 and 11. Other similar modifications may be obviously used and are to be considered as covered by this patent insofar as the scope of the appended claims permits.

Figure 4 illustrates a method by which the coating 8 can be moistened with a suitable ink-repellent liquid, such as a light oil. In this figure 13 represents a tank for holding the liquid, 14 and 15 are suitable rolls for transferring to roll 16 a thin film of the liquid. Roll 16 may be a metal roll covered with a fabric 17 faced with very fine spills or hairs similar to the nap on a carpet which act in the manner of a brush to coat the projections on the covering 8 with the liquid supplied from tank 13.

Tympan paper or similar coverings have been used for many years. The purpose of the covering is, of course, to prevent the wet ink which has been applied to one side of the paper from smearing or blurring while the opposite side of the paper is being printed. While the coverings previously used have permitted the use of this process of printing they have numerous disadvantages and are not well adapted to meet the demands set up by the rapid rates required in the modern newspaper or magazine printing room.

For example, certain materials such as the granular surfaced paper described in United States Patent No. 1,731,467 will not last long enough to print the complete daily output of a metropolitan newspaper or of a magazine with a large circulation. Since it takes a little time to replace the covering on a tympan roll and time is the very essence of life to a modern newspaper the use of granular surfaced paper is barred on these particular jobs. Accordingly, other materials which will last long enough are used although they admittedly are inferior to granular surfaced paper from the point of view of the quality of work performed and are in some instances considerably more expensive.

We have found that an improved tympan paper which will have sufficient life to meet the requirement of modern newspaper and magazine printing establishments and will at the same time produce results of equal or even superior quality to those obtained with granular surfaced paper can be made provided certain basic principles be followed. We will now give several examples by which such materials can be made, it being understood that the examples are for illustrative purposes only and are not intended to be limitative.

Example I

A suitable backing material such as paper of the kind known to the trade as "7 point cylinder stock" is coated with adhesive such as glue and

fused alumina abrasive grain which has been screened to pass through a standard 200 mesh and retained on a 220 mesh screen is dropped onto the adhesive coated paper while the glue is still fluid in the manner well known in the art of making abrasive coated paper or cloth products. After drying for a suitable time (for example 15 to 30 minutes) to allow the glue to harden the coated paper is given a surface coating by brushing or, preferably, spraying onto the coated surface of the paper a layer of an air drying lacquer which consists of a cellulose ester base plasticized to develop flexibility and dissolved in a volatile solvent. For example, the lacquer known as "clear Duco" can be used for this purpose. It is desirable for some purposes, but not essential, for reasons which will hereinafter be pointed out, that the coating of lacquer be of sufficient thickness, and be applied in such a manner (for example by suitably adjusting the viscosity of the lacquer) that the finished product will present a continuous surface of lacquer, the surface being serrated, however, because of the "hills and valleys" presented by the abrasive coated paper which forms a base for the lacquer.

The coated paper may then be dried by allowing it to stand in the air for a few minutes in order to allow evaporation of any volatile solvent in the sizing material and then "flexed" by passing over one or more suitable rolls in such a manner that the coating is cracked and the product made more flexible. A suitable apparatus for flexing is described in U. S. Patent No. 1,161,497. Provided the material used for sizing is itself sufficiently flexible, as is frequently the case, the flexing may of course be done prior to the final coating or sizing operation if this is, for any reason, considered desirable.

Example II

A coating of a flexible adhesive in the nature of a plasticized cellulose acetate is applied to a fabric backing by spraying onto a cloth base known as 30 inch, 3.75 jeans (the term signifies that 3.75 yards of the cloth 30 inches wide weighs one pound) the adhesive in the form of lacquer such as one made under United States Patent No. 1,710,453. While the coating is still "tacky" a grit is applied to the coated surface and the composite article is passed between a pair of rolls whereby the grit is pressed into the adhesive and the product is made to be of substantially uniform thickness when measured from the uncoated side of the cloth to the tops of the grits, the grits being submerged in the coating to a depth approximately one half their average diameter. The grit may be prepared by curing a phenolic condensation product resin such as one made in accordance with United States Patent No. 1,020,593, until it is substantially insoluble and infusible, crushing the cured resin and grading it by screening through a standard 180 and onto a standard 200 mesh screen. The lacquer may then be dried to remove the volatile solvent remaining in it.

Example III

Paper such as that used for making abrasive coated paper and known to the trade as "10 point cylinder stock" is coated with a flexible "Bakelite" varnish made by reacting a phenol and an aldehyde in the presence of a drying oil such as that disclosed in British patent 267,736 as an adhesive and a layer of abrasive grain such as fused alumina which has been screened through a 220 mesh and retained on a 240 mesh screen is applied in the manner well known in the abrasive art. The varnish is dried by heating in air for upwards of one hour at 135° C. or higher, and a sizing coat comprising styrol plasticized to make the dried product flexible is applied in the form of a solution in a suitable low-boiling solvent. The article is then dried to remove the solvent from the sizing coat.

Example IV

An intimate mixture of equal parts by weight of #200 mesh fused alumina and a cellulose ester lacquer, made under United States Reissue Patent No. 16,803, is uniformly applied to the surface of a sheet of cellulose nitrate which is known as "Kodaloid". The product is placed between plane metal plates to prevent curling and assure uniformity of thickness and is dried to remove the volatile solvent. As a result of the solvent action of the lacquer on the base this product is somewhat different from that of the previous examples where the bond is obtained by an adhesive action in contrast to the "welding" of the lacquer (bond) to the base obtained by the method of this example.

As an alternative to this method, the cellulose ester base may be softened by applying either a lacquer, a varnish (containing a solvent for the base) or a solvent which will attack the base and a suitable grit can then be added by dusting over the surface. A sizing coat may then be applied, if desired, and the product dried to remove the solvent.

The preceding examples illustrate several methods and materials for making our improved product. It has been necessary to provide numerous kinds of "tympan paper" because of the differing requirements of various types of printing establishments. A brief discussion of these facts will now be given in order to assist in determining approximately the kind of paper which would be required in a given set of circumstances.

The surface of a tympan roll must, in the case where it comes in contact with the side of a paper which is freshly printed, perform two functions: it must serve as a backing against which its print roll can press the paper being printed in order to transmit the surface to the paper, and it must be of such a nature that it will not cause the previously printed surface to blur either by causing the ink on that surface to flow or by transmitting to that surface ink which may have been taken up by the tympan paper from previously printed papers. Some of the conditions under which it must meet these requirements are briefly outlined below.

As is well known, newspapers must be prepared in the least possible time. It is impossible to spend any time in perfecting the type used, consequently the surfaces of the print rolls are likely to be somewhat irregular. This, of course, makes it necessary that the surface of the tympan or impression roll be comparatively soft and resilient so that these "high spots" on the print roll can be impressed into the tympan roll sufficiently to allow the remainder of the type to make suitable contact with the paper being printed. Furthermore, the paper used for newspapers is of a relatively cheap grade which absorbs ink readily and contains fine fibers which are easily picked up by any sharp points which may be exposed on the tympan paper. If this occurs the tympan becomes ink coated, the fibers acting as a sort of brush, and the defect known as

"offset" (application of ink in the wrong place) results.

On the other hand very high grade magazines employ a relatively smooth paper which does not readily absorb ink and is comparatively free from surface fibers, time is taken to perfect the print by compensating for high and low points and areas on the type plates by "making ready" which means in the printing art that the packing underneath the tympan top sheet is made thinner by cutting out parts of the packing, or thicker by adding thin pieces of paper; and in general the requirements of the tympan roll are quite different for this work than for a newspaper. Intermediate between these two extremes are all sorts of combinations and special requirements.

Another factor which must be taken into consideration is the fineness of printing used on pictures and illustrations. For example, a high class of printing uses a great many more "points" in reproducing half tone illustrations than does a cheaper grade. Since the coating on the impression roll acts as a backing against which the type roll can press, it is necessary that the points on the tympan paper be sufficient in number to provide a bearing for all points on the print roll. This, of course, requires a relatively finely divided grit on the tympan paper. On the other hand, where cheaper prints are made a coarser grit can be used with a corresponding increase in the number of copies than can be printed without getting "offset" because of the greater capacity of the "wells" between the high spots on the tympan paper.

We have discovered, however, that regardless of the kind of work being done it is highly advantageous that the surface of the tympan paper be such that if the bearings presented by the top of the grits (the "high points" of the serrated surface) be recorded, the record will present a uniform distribution both as to number and intensity. In other words, the grains should be uniformly distributed over the surface of the paper and the thickness of the product as represented by the distance from the uncoated side of the backing to the top of the serrations should be as uniform as possible. This latter effect can conveniently be obtained by using grit which has been closely graded; that is, by screening the grit and retaining only that part which will, for example, pass through a 240 mesh and be retained on a 260 mesh screen instead of using all that was passed through a 240 mesh as was previously the practise.

Naturally, the fineness and uniformity of the coating is dependent upon the shape as well as the grit size of the grain. For example, slivery needle-like grains will form a different type of surface than will blocky grain. The former may pass through a fine screen lengthwise and yet upon being applied to the surface of the paper, lie with their longest axis parallel with the paper. Such a paper would not present as many points as would a blocky grain nor would it be so likely to be uniform as to thickness from the under side of the backing to the top of the grain.

In order to provide grains of blocky character, a supply of pig is crushed into grains of coarser character than that ultimately desired, and then these coarser grains are mulled to round off the sharp corners of the grains and break up the flat and slivery grains. Mulling and screening within close limits reduces and eliminates the flat and slivery grains leaving those which are blocky in character.

We have developed a method for measuring this uniformity which is briefly as follows:

A wooden block of predetermined area is placed on the lower platen of a hydraulic press of suitable size. On the block are placed, successively, a sheet of wrapping paper, a sheet of bond writing paper, and a carbon paper (ink side to the writing paper) a sheet of tympan paper, serrated side down and a pad of sponge rubber. Pressure is applied to the assembly, for example 80 pounds per square inch of the area being measured (as calculated from the area of the block used as base) and the number of points recorded is measured microscopically. We have found that this method of measuring the uniformity of spacing and depth of coating provides a reliable means for predetermining the efficiency of a given product for a given job.

We have also found that it is important that tympan paper be relatively flexible as intimated by the fact that directions were given in Example I for flexing. If the paper is not sufficiently pliable poor printing results, presumably because the type is unable to impress the paper deeply enough to record over the entire surface of the type roll.

Another property which the paper must possess is the combination of resilience up to a critical pressure followed by plasticity if pressures beyond this critical value be exerted. This combination is demanded because of the process used in printing, a brief discussion of which may clarify this point.

In printing a large number of copies from two or more set-ups or forms, the type matter or plates from the first form makes an impression in the tympan top sheet. When the type matter or form is changed for the next set-up, the tympan sheet must have the quality of losing the impression made by the first form and be able to adapt itself to the following form. If indentations from the first form remain when printing the second, the latter printing will be defective. The foregoing considerations explain the necessity for resilience under pressures lower than the critical value. This resilience in the main body of the article may be in the backing, the adhesive or the grain or any two or more of these. The sizing material must, of course, be resilient itself in order to follow the alternate depressing and return of the paper.

In addition to being resilient, the parts of the article which are resilient must also resist "fatigue" by which is meant that they must retain their resilience under repeated flexing since a cessation of the return movement caused by resilience would make the paper ineffective and defeat the purpose for which it is used.

Furthermore in addition to being sufficiently resilient to permit this penetration without destruction of the granules, the grit itself must have sufficient compressive strength so that it is not crushed. If it is crushed the desirable features resulting from uniformity of grit size and distribution are, of course, nullified. For purposes of simplicity, we have herein used the word "tough" to describe this quality of resistance to crushing.

The coated surface of the paper must, of course, be insoluble both in printing ink and in solvents in which ink is soluble. The latter property is required because it is customary to clean the

surface of the paper and remove therefrom the accumulated ink by scrubbing the surface with an ink solvent and then patting it dry. A brush, moistened with an ink solvent, is suitable for scrubbing the surface, and a cloth is suitable for patting it dry.

Another property which is essential for the coated surface of the paper to possess is ink-repellency. This may be developed by using an ink-repellent sizing material when the sizing covers the entire surface, while if the grains project throughout the sizing coat they must themselves be ink-repellent as well as the sizing material. While our product is so made that it is, itself, ink-repellent, we have sometimes found it desirable to magnify this property by the method illustrated in Figure IV of the drawing. By applying a very thin film of an ink-repellent liquid to the tops of the serrations by means of an apparatus similar to that illustrated, the natural repellency of the coated fabric is enhanced and the effective life of the tympan paper is sometimes increased thereby.

The examples which we have included contain only a few of the materials which we have found suitable for making our improved product. For instance, other adhesives which we have found suitable for use as a binder are casein solutions, other types of varnishes and lacquers and solutions of resins and/or cellulose esters and ethers in general may be used. Similarly, any of these materials which are ink repellent and are sufficiently flexible may be used for "sizing" the coated backing. Flexibility may, of course, be imparted or increased by blending suitable plasticizing agents such as dibutyl phthalate, tributyl or tricresyl phosphate, or by reacting the resin-forming ingredients in the presence of suitable oils as exemplified by the binder used in Example III as above.

Similarly, we have found that, for certain purposes, granular materials which would ordinarily not be classed as abrasives are suitable in the manufacture of tympan paper, as illustrated by the use of "Bakelite" in Example II. For example, we may use, instead of the resin, the product resulting from curing a molding compound such as a mixture of a phenolic resin and hardwood flour or other inert filler and pulverizing and grading the grit obtained. Other substances such as pulverized hard coal, coke, slags, or other relatively inert and ink-repellent materials may similarly be used for certain purposes. This class of granular materials may be conveniently designated "non-abrasive", meaning that they are of less hardness than such conventional grits as fused alumina, silicon carbide, corundum garnet and emery which are 7 or more on the Mohs scale.

We have also used other fabrics for the backing than those cited in the example. For instance, a latex-impregnated paper, one surface of which has been coated with a pigment such as the material sold as "Premoid", can be used; or other types of cloth such as airplane cloth, typewriter ribbon material or other fabrics of suitable strength may be substituted for the jean illustrated in Example II. We have also successfully used sheets of cellulose nitrate or acetate for the backing as illustrated by Example IV.

In order to provide for the various conditions to be met intermediate between the two extremes of newspapers (which require a soft packed roll) and high grade magazines (which require a hard packed roll) we have sometimes found it desirable to furnish certain degrees of resilience by using backing materials which are themselves more or less elastic. The plasticized cellulose ester used in Example IV represents one such material. Other suitable fabrics such as latex-impregnated cloths, compounds consisting of a resilient filler like cork bonded with suitable organic bonds, and the like, may be used to secure this property.

Another improvement which we have sometimes found to be very effective for certain purposes consists in coating the under side of the tympan paper with an abrasive material. Since the print rolls leave an impression in the tympan paper corresponding to the print it is essential that there be no displacement of the tympan paper around the tympan roll. Providing the tympan paper with an abrasive coating on the under side helps prevent slipping and thereby eliminates the "offset" which results when slipping occurs.

While we ordinarily secure the serrated surface which has been found desirable in tympan paper by coating the base with a granular material, it is also within the scope of our invention to secure the serrations by roughening the paper. This may be done, for eample, by passing fabric which has an ink-repellent surface through rolls provided with suitable projections whereby a serrated effect is impressed on the tympan paper by distortion of the fabric.

The term "tympan paper", when used herein, is intended to mean the material used to cover tympan or impression rolls as described in this specification regardless of the kind of material (whether paper or cloth) used as a backing. Similarly, the word "fabric" is herein defined as the material used as a backing which may be paper, cloth, cellulose ester or other suitable substances. We have also used the word "grit" to signify a granular material regardless of its abrasive properties.

Obviously, the present invention is not limited to the particular embodiments herein shown and described, neither is it necessary that all the features of the invention be used conjointly, since they may be employed advantageously in various combinations and sub-combinations.

We claim:

1. Tympan or printing blanket comprising a fabric base sheet, a flexible resilient ink-repellent layer on the base, and tough grit material associated with the ink-repellent layer.

2. Tympan or printing blanket comprising a base sheet, a flexible resilient ink-repellent layer on the base, and tough grit material associated with the ink-repellent layer.

3. Tympan or printing blanket comprising a fabric base sheet, cellulose ester adhesive on the base, and tough grit material associated with the adhesive material.

4. Tympan or printing blanket comprising a base sheet, cellulose ester adhesive on the base, and tough grit material associated with the adhesive material.

5. Tympan or printing blanket comprising a base sheet, resilient ink-repellent adhesive material applied to one face of the sheet, grit material adhered to the adhesive material, and sizing material applied to provide a surfacing layer over the grit material.

6. Tympan or printing blanket comprising a base sheet, resilient adhesive material applied to

one face of the sheet, grit material adhered to the adhesive material, and sizing material applied to cover the grit material and provide an ink-repellent surface.

7. Tympan or printing blanket comprising a base sheet, and a granular material applied to cover one face of the sheet, said granular material being substantially blocky in character and uniform in size to provide uniform supporting points distributed over the area of the sheet.

8. Tympan or printing blanket comprising a base sheet, an adhesive layer applied to one face of the sheet, and granular material adhered to the adhesive layer, said granular material being substantially blocky in character and uniform in size to provide uniform supporting points distributed over the area of the sheet.

9. Tympan or printing blanket comprising a base sheet, an adhesive layer applied to one face of the sheet, and substantially blocky granules of uniform size adhered to the adhesive layer, one of the said elements being elastic in character to compensate for the irregularities in the printing element.

10. Tympan or printing blanket comprising a base sheet, an adhesive layer on said base sheet, and grit material associated with the adhesive layer, one of the aforesaid elements being resilient in character to compensate for the irregularities in the printing element.

11. Tympan or printing blanket comprising a base sheet, an adhesive layer applied to one face of the sheet, and granular material substantially uniform in size adhered to the adhesive layer, one of said elements being elastic in character to compensate for the irregularities of the face of the printing element.

12. Tympan or printing blanket comprising a foundation of composition material and granular material associated with the foundation, one of said materials being resilient in character to compensate for the irregularities of the face of the printing element.

13. Tympan or printing blanket comprising a base sheet, an adhesive layer applied to one face of the sheet, and substantially blocky granules of uniform size adhered to the adhesive layer, said adhesive layer being elastic in character to compensate for the irregularities in the printing element.

14. Tympan or printing blanket comprising a base sheet, a resilient ink-repellent adhesive layer applied to said base sheet, and fused alumina granules secured to the adhesive layer.

15. Tympan or printing blanket comprising a base sheet, a cellulose ester adhesive layer applied to said base sheet, and fused alumina granules secured to the adhesive layer.

RAYMOND C. BENNER.
CHARLES E. WOODDELL.
THEODORE E. KNOWLTON.