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C. CAMPBELL ETAL

3,092,236

INK TRANSFER IMPRESSION-MAKING RIBBONS

Filed May 25, 1960

FIG. 1

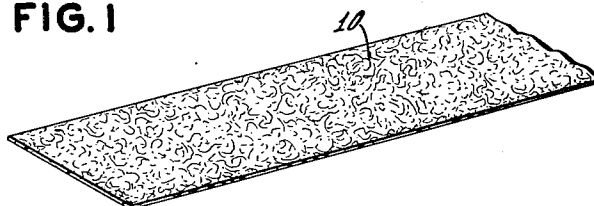


FIG. 2

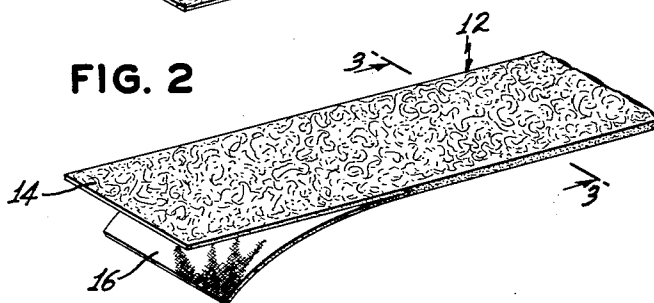


FIG. 4

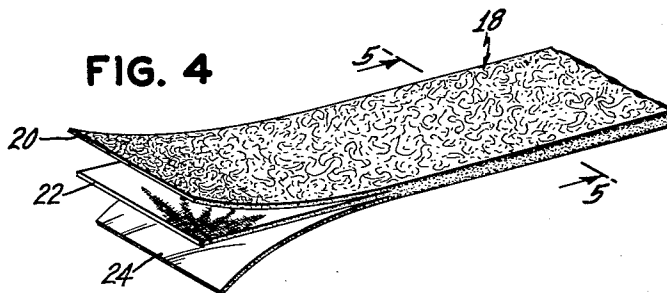


FIG. 3

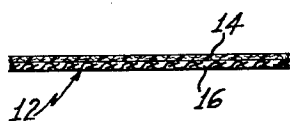
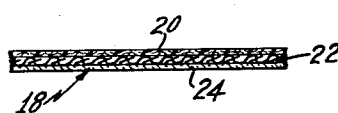


FIG. 5



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INK TRANSFER IMPRESSION-MAKING RIBBONS

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12 Claims. (Cl. 197—172)

The present invention relates to improvements in ink transfer impression-making articles, such as typewriter ribbons, ribbons used in Addressograph machines, calculating machines, and the like.

Present typewriter ribbons are relatively expensive because of the high cost of the textile material employed and because of the expensive process involved in making the typewriter ribbons from textile material. In order to obtain proper results, the textile material must of necessity be of high quality and be of a fine weave to provide a satisfactory inking surface on the ribbon. The impressions made on a typewriter with the woven ribbon of the usual type are composed of a series of interrupted inked surfaces having screen or fabric marks corresponding to the outlines of the particular threads comprising the typewriter ribbon which were under the metal type letters of the typewriter when the typewritten impressions were formed on the paper. This may be readily seen when the typed letters are magnified. This defect lies mainly in the woven material of the typewriter ribbon itself and may be lessened by employing a textile material for the ribbon having a fine weave, but this obviously increases the cost of the ribbon.

In view of the above, ink transfer ribbons have been made from materials other than woven textile fabric, but these materials have serious defects in that they are relatively expensive and do not provide the durability, and improved results commensurate with the cost thereof. An example of such typewriter ribbon is described in United States Patent No. 1,533,382, issued to Charles Campbell, one of the co-inventors of the present invention, which relates to a typewriter ribbon composed of fused cellulose fibers.

According to the invention, there is provided a typewriter ribbon comprising a strip of material, which material is made from fused synthetic fibers such as nylon, Dacron or rayon, or a combination thereof. The strip which is made of such fused synthetic fibers is devoid of the undesirable characteristics in woven ribbons, namely, the characteristic of providing printed letters which are not uniformly inked due to the weave in such woven fabric.

According to the present invention there is also provided a two-ply typewriter ribbon, one ply of which comprises a strip of material made of fused synthetic fibers, and the other ply of which comprises a woven fabric. The woven fabric is for the purpose of absorbing and holding a substantial amount of ink which it can continuously transfer to the fused strip so as to, in fact, act as a well or reservoir of ink for the ribbon. Due to the fact that the impression made on the paper comes from the impact of the key as transferred through the homogeneous strip of fused fibers, the typewritten letter has the desired uniformity, while a continuous supply of ink is available to such strip by means of the woven strip.

According to another aspect of the invention, there is provided a three-ply ribbon comprising a strip made of fused artificial fibers for obtaining uniformity in the impression, an intermediate strip of woven fabric to define an ink reservoir, and a plasticizer film for preventing ink and dirt from getting into the keys.

It is therefore an object of the invention to provide ink

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transfer impression-making ribbons which will produce impressions of improved quality, similar to printed type.

Another object of the present invention is to provide an ink transfer ribbon comprised of fused synthetic fibers.

Another object of the present invention is to provide an ink transfer ribbon comprising two plies, one of said plies being made of fused synthetic fibers and the other of said plies being made of woven fabric.

Another object of the invention is to provide an ink transfer ribbon comprising three plies, one of said plies being made of fused synthetic fibers, another of said plies being made of woven fabric, and a third ply being made of a very fine synthetic fabric or of a plasticizer film.

A further object of the present invention is to provide an ink transfer ribbon of relatively low cost having qualities superior to typewriter ribbons heretofore known.

The above and other objects, features and advantages of the present invention will be more fully understood from the following description considered in connection with the accompanying illustrative drawings.

In the drawings:

FIG. 1 illustrates a one-ply ink transfer ribbon in accordance with the invention;

FIG. 2 illustrates a two-ply ink transfer ribbon in accordance with the invention;

FIG. 3 is a section taken along line 3—3 of FIG. 2;

FIG. 4 illustrates a three-ply ink transfer ribbon in accordance with the invention; and

FIG. 5 is a section taken along line 5—5 of FIG. 4.

The ribbon 10 illustrated in FIG. 1 comprises a narrow strip of material having a substantially uniform width and thickness, as is common in ribbons intended for use in a typewriter. The strip of material is impregnated with a marking substance or ink in any well known manner and comprises a mass of fibers composed of a synthetic or plastic material, the fibers being partially fused and thereby held in position relative to each other without the necessity of using any binders or resins.

The fibers lie in random directions, thereby providing a substantially homogeneous surface and superior structure which permits the forming of a uniform solid inked surface within the limits of the characters (letters or numerals) of the typewriter, Addressograph or calculating machine, as the case may be. Since ribbon 10 is not woven, the grating or screen effect which is a common characteristic of woven ribbons does not appear.

The fibers employed in ribbon 10 are composed of synthetic or plastic material such as a polyamide, manufactured under the name nylon, a polyester, manufactured under the trademark "Dacron," or the synthetic manufactured under the name of rayon. By employing any of the foregoing plastic materials for the fibers of the ribbon of the present invention it is possible to provide a homogeneous mass of material by partial fusing of the fibers, thereby eliminating the necessity of using any binders or resins. While no other agent, such as a binder or resin, is necessary to obtain the fusing of the fibers, an emulsion of 100% of the particular synthetic employed may be used for the fusing of the fibers. For example, when strip 10 is made of fused nylon fibers, a 100% nylon emulsion may be used.

The ribbon 10 in accordance with the present invention may be made wholly of nylon, wholly of Dacron, or wholly of rayon. In accordance with the invention ribbon 10 can also be made of a combination of more than one of the above mentioned synthetic fibers, fused together.

Whether the ribbon 10 is made wholly of one of the above mentioned synthetic materials or of a plurality of them, the resulting ribbon is provided with additional strength and durability, and with superior cutout resistance to the forces of the typewriter keys striking the rib-

bon than the cutout resistance offered by typewriter ribbons made heretofore. The use of fibers composed of synthetic plastic materials as described above permits the use of marking substances and inks, including synthetic inks, in a manner which has not been practical with ribbons composed of other materials. Furthermore, ink transfer ribbons made of synthetic fused fibers do not require treatment at the edges thereof to prevent fraying. In addition to the foregoing, ribbons made of synthetic fused fibers have provided better results not only on the first or original typed sheet, but also on carbon copies of the original sheet.

The ink transfer ribbon 10, as described above, has excellent ink retention properties. According to the invention, however, it has been found that such ink retention properties are improved by coating the fused synthetic fiber strip with a solution of base liquid using a percentage of filler of diatomaceous earth in percentages ranging from 2 to 10 percent, which is chemically inert and which has been rigidly controlled for fineness. It has been found also that needle-like particle shapes produced by a hydrothermal action of diatomaceous silica with a source of calcium could be used to advantage in bringing about improved absorptive qualities in the synthetic fiber impression material. The use of diatomaceous particles in connection with a fused synthetic fiber strip also improves the uniformity of the impression made and allows faster drying of the ink after the character impression has been made.

Referring now to FIGS. 2 and 3 of the drawings, there is shown another embodiment of an ink transfer ribbon in accordance with the invention. Ribbon 12 is a two-ply ribbon, comprising of ply 14 and ply 16, the two plies being joined to each other along the edges thereof, by fusing or by any other suitable means. Ply 14 comprises a strip of fused synthetic fibers exactly as strip 10 described above in connection with FIG. 1. Thus, ply 14 may be made of 100% Dacron fused fibers, 100% rayon fused fibers, 100% nylon fused fibers, or any combination thereof. Ply 16 comprises a strip of woven fabric. When the two-ply ribbon has been properly inked, the woven ply acts as a reservoir of ink so as to continuously supply ink to the ply 14. The ply 14 is adapted, when in use, to be in confronting relation with the paper on which the writing is being done while the woven ply 16 is adapted to be stricken by the keys of the typewriter, calculator machine, etc. The combination of the two plies 14 and 16 in ribbon 12 impart thereto superior qualities heretofore unknown. More specifically, the impression made has all the qualities of uniformity and evenness due to the fact that it is the fused fiber strip which transfers the ink to the paper. The ribbon 14 has a long life due to the fact that substantial amounts of ink may be carried thereby by means of the woven ply 16. The woven ply 16 need not be a fine weave since the ink is transferred to the paper from the synthetic fiber strip, and the cost of said woven ply is relatively small.

While ribbon 12 is illustrated in FIG. 2 as comprising plies 14 and 16 joined to each other only along the edges thereof, it is also possible to join the two plies to each other in surface-to-surface relation throughout the entire extent thereof to in fact form a ribbon having two laminated plies.

Referring now to FIG. 3, there is shown another embodiment of the ink transfer ribbon 18, in accordance with the invention. Ribbon 18 is a three-ply ribbon, consisting of ply 20, intermediate ply 22 and ply 24. Ply 20 is in all respects similar to strip 10 described in connection with FIG. 1 above, and is for the purpose of providing a uniformly sharp impression on the papers, as explained above. Intermediate ply 22 is in all respects identical to ply 16 described in connection with FIG. 2 above, and comprises a highly absorbent material which acts as an inkwell or an ink reservoir for continuously supplying ink to the fused fiber ply 20. The third ply,

namely ply 24, comprises another synthetic fabric or a plasticizer film. The three plies are joined to each other along the edges thereof, as shown, or may be laminated to each other. The third ply 24 is impervious to the ink and therefore acts as a barrier to prevent ink and other dirt particles from penetrating in the keys of the particular machine with which the ribbon is used. It is therefore seen that ribbon 18 has all the advantageous characteristics of the ribbons in FIG. 1 and FIG. 2, and in addition is provided with the feature of keeping the keys clean. As a result, the ribbon in FIG. 3 provides a most satisfactory sharp and clear impression, and has a long life and durability with excellent performance during such life. The third ply 24 may consist of a polypropylene film or other types of transparent films having the properties described above for such third ply. A full description of the polypropylene film suitable for use as ply 24 is set forth in the co-pending application Serial No. 855,512 (now abandoned) of Fred R. Barning, one of the inventors herein, which application was filed November 27, 1959.

This application is a continuation-in-part of our application, Serial No. 831,731, filed August 5, 1959, now abandoned.

While we have shown and described the preferred embodiments of our invention, it will be understood that the invention may be embodied otherwise than as herein specifically illustrated or described, and that in the illustrated embodiments certain changes in the details of construction and in the form and arrangement of parts may be made without departing from the underlying idea or principles of this invention within the scope of the appended claims.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. An impression-making ribbon adapted to be struck by keys of a machine for making an impression on a sheet of paper or the like, comprising a plurality of plies joined to each other, one of said plies being a narrow strip of material comprising a multitude of randomly arranged synthetic plastic fibers fused together and collectively defining said one ply, another of said plies comprising a narrow strip of woven material having high ink absorbent properties, said one and said another of said plies being impregnated with ink, said one ply being adapted to be in confronting relation with said sheet of paper.

2. An impression-making ribbon adapted to be struck by keys of a machine for making an impression on a sheet of paper or the like, comprising a plurality of plies joined to each other, one of said plies being a narrow strip of material comprising a multitude of randomly arranged synthetic plastic fibers fused together and collectively defining said one ply, another of said plies comprising a narrow strip of woven material having high ink absorbent properties, said one and said another of said plies being impregnated with ink, said synthetic material being nylon, said one ply being adapted to be in confronting relation with said sheet of paper.

3. An impression-making ribbon adapted to be struck by keys of a machine for making an impression on a sheet of paper or the like, comprising a plurality of plies joined to each other, one of said plies being a narrow strip of material comprising a multitude of randomly arranged synthetic plastic fibers fused together and collectively defining said one ply, another of said plies comprising a narrow strip of woven material having high ink absorbent properties, said one and said another of said plies being impregnated with ink, said synthetic material being a polyester, said one ply being adapted to be in confronting relation with said sheet of paper.

4. An impression-making ribbon adapted to be struck by keys of a machine for making an impression on a sheet of paper or the like, comprising a plurality of

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plies joined to each other, one of said plies being a narrow strip of material comprising a multitude of randomly arranged synthetic plastic fibers fused together and collectively defining said one ply, another of said plies comprising a narrow strip of woven material having high ink absorbent properties, said one and said another of said plies being impregnated with ink, said synthetic material being a combination of nylon and a polyester, said one ply being adapted to be in confronting relation with said sheet of paper.

5. An impression-making ribbon adapted to be struck by keys of a machine for making an impression on a sheet of paper or the like, comprising a plurality of plies joined to each other, one of said plies being a narrow strip of material comprising a multitude of randomly arranged synthetic plastic fibers fused together and collectively defining said one ply, another of said plies comprising a narrow strip of woven material having high ink absorbent properties, said one and said another of said plies being impregnated with ink, said plies being joined to each other only along their edges, said one ply being adapted to be in confronting relation with said sheet of paper.

6. An impression-making ribbon adapted to be struck by keys of a machine for making an impression on a sheet of paper or the like, comprising a plurality of plies joined to each other, one of said plies being a narrow strip of material comprising a multitude of randomly arranged synthetic plastic fibers fused together and collectively defining said one ply, another of said plies comprising a narrow strip of woven material having high ink absorbent properties, said one and said another of said plies being impregnated with ink, said synthetic material being a combination of a polyester and rayon, said one ply being adapted to be in confronting relation with said sheet of paper.

7. A multi-ply ribbon adapted to be struck by keys of a machine for making a visible impression on a sheet of paper or the like, comprising a first ply being a narrow strip of material comprising a multitude of randomly arranged synthetic plastic fibers fused together and collectively defining said first ply, a second ply comprising a narrow strip of woven material having high ink absorbent properties, and a third ply comprising a thin synthetic plasticizer film impervious to ink, said first and second plies being impregnated with ink, said three plies being joined together, said first ply being adapted to be in confronting relation with said sheet of paper for imparting a uniformly inked impression thereto, said second ply being intermediate the first and third ply and defining an ink reservoir for said first ply, said third ply being adapted to be struck by said keys, and defining means for preventing any ink or dirt from clogging up said keys.

8. A multi-ply ribbon adapted to be struck by keys of a machine for making a visible impression on a sheet of paper or the like, comprising a first ply being a narrow strip of material comprising a multitude of randomly arranged synthetic plastic fibers fused together and collectively defining said first ply, a second ply comprising a narrow strip of woven material having high ink absorbent properties, and a third ply comprising a thin synthetic plasticizer film impervious to ink, said first and second plies being impregnated with ink, said three plies being joined together, said first ply being adapted to be in confronting relation with said sheet of paper for imparting a uniformly inked impression thereto, said second ply being intermediate the first and third ply and defining an ink reservoir for said first ply, said third ply being adapted to be struck by said keys, and defining means for preventing any ink or dirt from clogging up said keys, the fibers forming said first ply being nylon, said third ply being a polypropylene film.

9. A multi-ply ribbon adapted to be struck by keys of a machine for making a visible impression on a sheet of

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paper or the like, comprising a first ply being a narrow strip of material comprising a multitude of randomly arranged synthetic plastic fibers fused together and collectively defining said first ply, a second ply comprising a narrow strip of woven material having high ink absorbent properties, and a third ply comprising a thin synthetic plasticizer film impervious to ink, said first and second plies being impregnated with ink, said three plies being joined together, said first ply being adapted to be in confronting relation with said sheet of paper for imparting a uniformly inked impression thereto, said second ply being intermediate the first and third ply and defining an ink reservoir for said first ply, said third ply being adapted to be struck by said keys, and defining means for preventing any ink or dirt from clogging up said keys, the fibers forming said first ply being a polyester, said third ply being a polypropylene film.

10. A multi-ply ribbon adapted to be struck by keys of a machine for making a visible impression on a sheet of paper or the like, comprising a first ply being a narrow strip of material comprising a multitude of randomly arranged synthetic plastic fibers fused together and collectively defining said first ply, a second ply comprising a narrow strip of woven material having high ink absorbent properties, and a third ply comprising a thin synthetic plasticizer film impervious to ink, said first and second plies being impregnated with ink, said three plies being joined together along their edges only, said first ply being adapted to be in confronting relation with said sheet of paper for imparting a uniformly inked impression thereto, said second ply being intermediate the first and third ply and defining an ink reservoir for said first ply, said third ply being adapted to be struck by said keys, and defining means for preventing any ink or dirt from clogging up said keys.

11. A multi-ply ribbon adapted to be struck by keys of a machine for making a visible impression on a sheet of paper or the like, comprising a first ply being a narrow strip of material comprising a multitude of randomly arranged synthetic plastic fibers fused together and collectively defining said first ply, a second ply comprising a narrow strip of woven material having high ink absorbent properties, and a third ply comprising a thin synthetic plasticizer film impervious to ink, said first and second plies being impregnated with ink, said three plies being joined together, said first ply being adapted to be in confronting relation with said sheet of paper for imparting a uniformly inked impression thereto, said second ply being intermediate the first and third ply and defining an ink reservoir for said first ply, said third ply being adapted to be struck by said keys, and defining means for preventing any ink or dirt from clogging up said keys, the fibers forming said first ply being a combination of nylon and rayon, said third ply being a polypropylene film.

12. A multi-ply ribbon adapted to be struck by keys of a machine for making a visible impression on a sheet of paper or the like, comprising a first ply being a narrow strip of material comprising a multitude of randomly arranged synthetic plastic fibers fused together and collectively defining said first ply, a second ply comprising a narrow strip of woven material having high ink absorbent properties, and a third ply comprising a thin synthetic plasticizer film impervious to ink, said first and second plies being impregnated with ink, said three plies being joined together along their edges only, said first ply being adapted to be in confronting relation with said sheet of paper for imparting a uniformly inked impression thereto, said second ply being intermediate the first and third ply and defining an ink reservoir for said first ply, said third ply being adapted to be struck by said keys, and defining means for preventing any ink or dirt from clogging up said keys, the fibers forming said first ply being a combination of a polyester and rayon.

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