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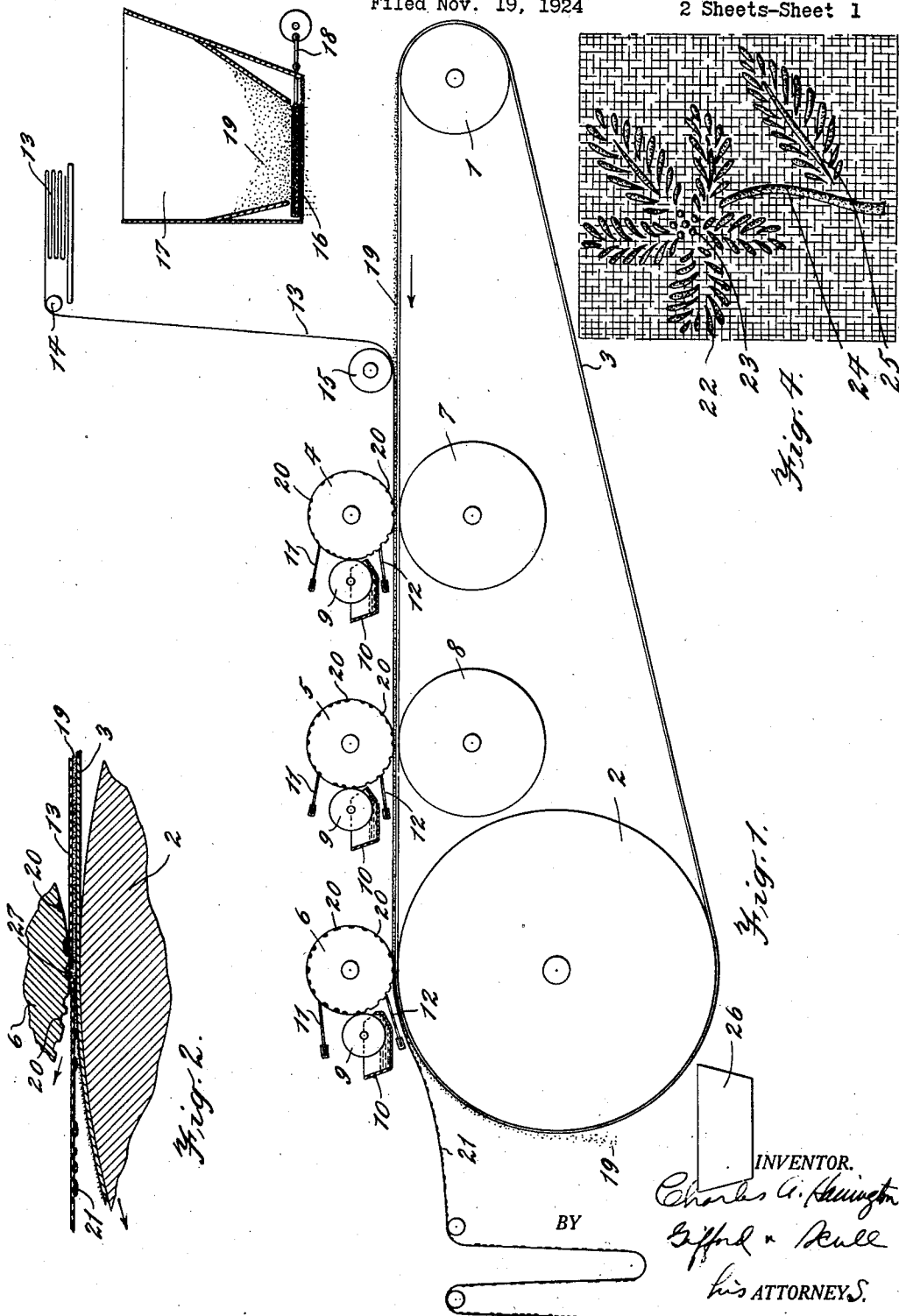
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2 Sheets-Sheet 1



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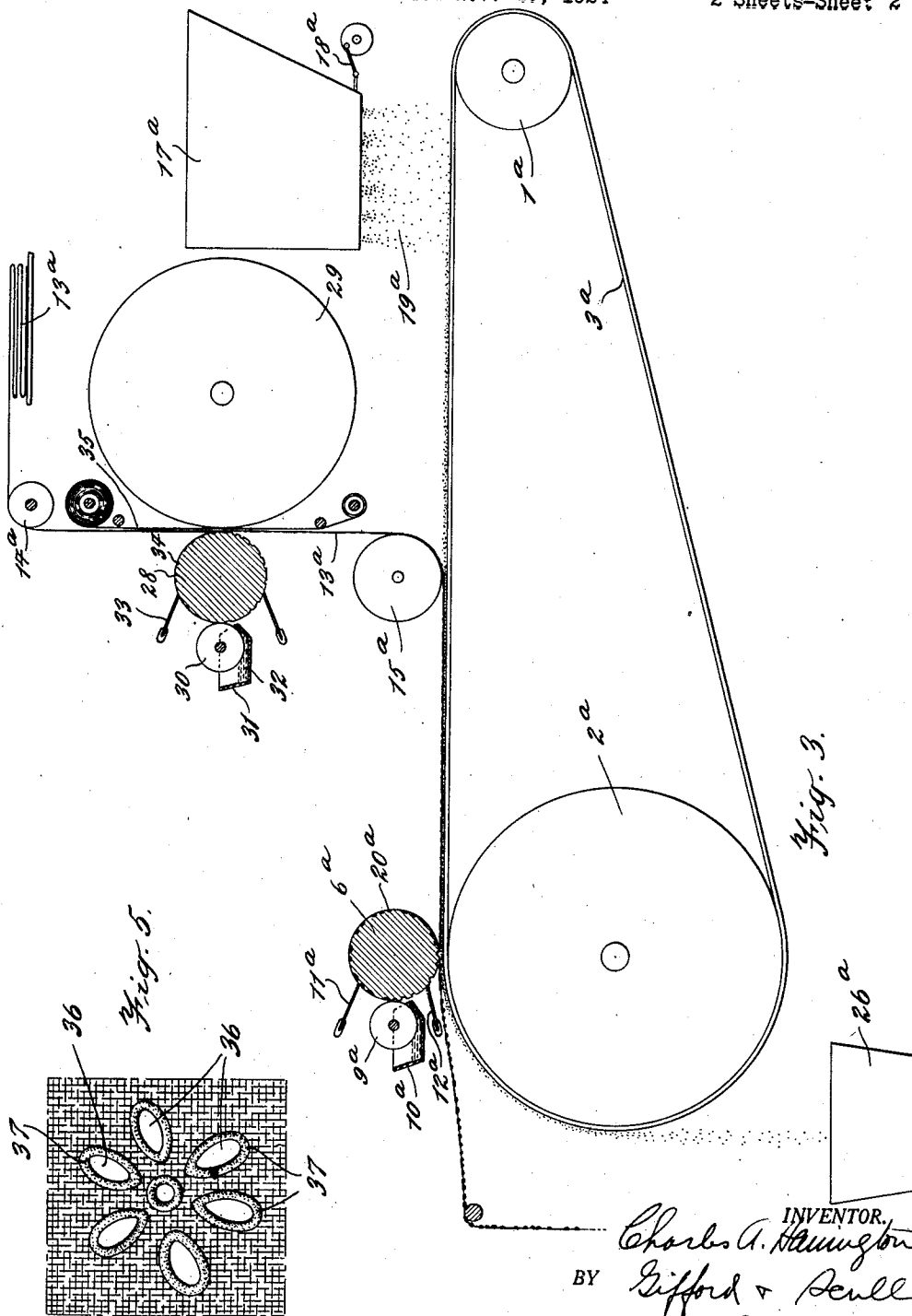
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2 Sheets-Sheet 2



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METHOD FOR FORMING RAISED DESIGNS ON CLOTH AND THE LIKE.

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My invention relates to method for forming raised designs on loosely woven fabrics, such as georgette crepe, cotton voile, organ-
dy and other similar materials.

Attempts have been made heretofore to print raised outline or solid effects upon fabrics by the use of deeply engraved rollers, but the results have not been satisfactory, because the printing materials could not be made to leave the engravings on the roller on account of the depth of the engravings and the heavy body of the printing material which was necessary to produce the desired height of design. If sufficient pressure were applied to the arrangements heretofore attempted to force the fabric partially into the engravings so as to adhere to and pull the heavy printing material out of the engravings, it has been found that the printing material is forced through the fabric onto the soft blanket or backing cloth usually used in such processes and absorbed by it. This leaves only a thin, weak impression upon the fabric and therefore does not give the desired raised effect. Such material is not commercial.

If instead of the soft blanket which absorbs the printing material, as above explained, a harder blanket or bed should be used and sufficient pressure applied to force the fabric into the engravings to remove the printing material, the printing material would be forced through the fabric onto the hard surface of the blanket and smeared on the cloth so as to completely destroy the design effect or to so blur the same as to render it non-commercial.

In my invention I have taken advantage of these difficulties by interposing between the blanket or backing cloth and the cloth to be printed, a bed of comminuted material of a character adapted to absorb the printing material and to so combine with the printing material as to form the desired raised designs on the cloth on the side opposite the engraved roller. By this method a more fluid printing material may be used and deeper engravings may be used, and when pressure is applied the cloth is forced into the engravings and the printing material forced through the cloth into the soft comminuted material which absorbs the same or unites with it to form the body of the raised design. By this method any desired comminuted material may be used,

such, for instance, as cotton flock, minute beads, minute granules of metal or any other material of which it is desired to make the raised designs.

Many forms of apparatus may be used to carry out my method, but I have illustrated an apparatus by which the same may be performed and have illustrated said apparatus in the accompanying drawings, in which,

Fig. 1 shows a side elevation of such an apparatus in diagrammatic form;

Fig. 2 shows a partial section of the rollers and cloth;

Fig. 3 shows a side elevation in diagrammatic form of a modification of my invention;

Fig. 4 shows an example of a design produced by the machine shown in Fig. 1; and

Fig. 5 shows an example of a design produced by the machine shown in Fig. 3.

It is of course understood that all of the apparatus and the designs shown are merely for the purpose of illustration, as many modifications and changes may be made therein.

Referring first to the machine shown in Figs. 1 and 2, the same comprises rollers 1 and 2 over which runs an endless belt 3 of any suitable soft material. The material usually employed in the art for this purpose is made up of rubberized canvas which lends strength to the belt and the canvas is usually covered with some soft material, such as felt, so that the belt not only has sufficient strength but the desired softness also. Engraved rollers 4, 5 and 6 are placed above the belt 3 and rollers 7 and 8 cooperate with the rollers 4 and 5, respectively, and the roller 2 cooperates with the roller 6. The rollers 1, 2, 7 and 8 are usually made of wood, iron and steel and have a plain surface over which the belt 3, usually known as the blanket, runs. In some instances it may be desirable to cover the surfaces of the rollers 2, 7 and 8 with a relatively soft, resilient or elastic surface for a purpose which will appear later.

With each of the rollers 4, 5 and 6 cooperates a roller or brush, or other suitable mechanism 9, for spreading or applying the printing material or "color" from the receptacle 10 onto the engraved rollers 4, 5 and 6. The printing material is first applied to the rollers 4, 5 and 6 by the cooperating rollers 9 and the excess material is removed from

the surface of the engraved rollers by the doctor scraper 11. These scrapers 11 may also act to press the printing material compactly into the engravings of rollers 4, 5 and 6. Scrapers 12 engage the rollers 4, 5 and 6 and act to remove from the rollers any undesirable materials, such, for instance, as fibres or lint which may be on top of the cloth being printed. By the action of the scrapers 11 and 12 the surfaces of the engraved rollers are kept clean.

The cloth to be printed is shown at 13 and is led over a guide roller 14 and a second guide roller 15 onto the surface of a blanket or bed of comminuted material which is placed on the belt 3 by means of a sieve or sifter arrangement 16 placed at the bottom of a receptacle 17 and actuated by an eccentric 18, which is operated from any suitable source. The comminuted material 19 is uniformly distributed over the surface of the belt 3 to any desired depth. The depth of the material 19 on the belt 3 is regulated by the speed of the belt 3 and the speed of the eccentric 18 and the size of openings in the sieve 16. As the belt moves in the direction of the arrow in Fig. 1, a layer or blanket of comminuted material 19 is placed thereon and the cloth 13 is then placed on top of the comminuted material as the cloth passes over roller 15. The two then pass together between rollers 4 and 7. These rollers are adjusted so as to cause considerable pressure between them and the printing material which is held in the engravings 20, in the surface of the roller 4, is forced through the cloth 13 into the comminuted material 19, whereupon the printing material is absorbed by the material 19, thus cementing the particles of material 19 to form the raised design 21 on the side of the cloth opposite the engraved rollers. In the embodiment shown in Fig. 1, the three rollers 4, 5 and 6 are preferably supplied with printing material of different colors so that when the cloth emerges from the machine a design will be printed in three colors. For instance, referring to the design shown in Fig. 4, the petals 22 may be red, the center 23 and stem 24 may be yellow, and the leaves 25 may be green. Obviously any other desired color combination may be employed. In the event that only one color is desired, two of the rollers 4, 5 and 6 may be omitted and in this instance I would prefer to omit the rollers 4 and 5.

After the cloth has passed between the rollers 4 and 7, it passes between rollers 5 and 8 where a similar action takes place and the design of the desired color is placed on the cloth in a manner similar to that explained with relation to rollers 4 and 7. Likewise as it passes between rollers 2 and 6 a design from roller 6 is applied to the cloth in the same manner, so that when the

cloth leaves the machine a complete design is placed thereon and the excess comminuted material 19 drops into a receptacle 26 and may be returned to the receptacle 17 again to be sprinkled upon the belt 3.

The comminuted material is of any desired color, usually white, and that part of it which is picked up or absorbed or cemented by the different printing materials or colors, takes the color of the printing material, because usually the particles of the comminuted material are themselves porous, and therefore absorb the colors which are applied to the rollers 4, 5 and 6.

In the foregoing description and the appended claims, in referring to the absorption of material I do not desire to be limited to porous material, but intend that this term shall be broad enough to cover any material the particles of which shall be held together by the printing material which comes from the engraved rollers. For instance, small beads or metal particles when sprinkled on the belt 3 form a layer of material which will absorb the printing material although the individual particles of such material do not absorb any of the printing material.

In Fig. 2, I have shown in an exaggerated form what I conceive the action to be in the formation of the raised design on the cloth. This action is probably as follows: As the belt 3 with the material 19 and cloth 13 thereon, passes between a pair of rollers, as for example, rollers 2 and 6, due to the softness or resiliency of the material between the rollers 2 and 6, the cloth is apparently forced up into the engravings 20 in the rollers 6, as shown at 27. This of course forces the material which is in the engravings 20 through the cloth 13 into the material 19, whereupon the printing material combines with the material 19 or cements the particles of the material 19 together to form the raised design 21. The printing material acts to hold the design onto the cloth by reason of the fact that the interstices of the cloth which come into contact with the engraved portion of the roller, are completely filled with the printing material which acts to cement the design onto the cloth and retain it there.

From the foregoing it will be apparent that any desired height of design may be secured by properly designing the depth of the engravings on the roller and by properly selecting the desired thickness of the layer of comminuted material into which the material is forced. This design may be placed on the cloth without any of the objections heretofore encountered, and particularly that of smearing the printing material on the cloth. The method therefore results in a clean-cut design of any desired height. If greater resilience or softness between the

cooperating rollers is desired than that afforded by the cloth, blanket and comminuted material, the surface of the backing roller may be covered by soft rubber or other resilient material.

In Fig. 3, I have shown a somewhat modified form of machine for carrying out my invention. This machine comprises rollers 1^a and 2^a over which runs a belt 3^a similar to that heretofore explained. A receptacle 17^a contains material 19^a which is sprinkled upon the belt 3^a by an eccentric mechanism 18^a, all in the manner heretofore explained. The cloth 13^a passes over the roller 14^a and from there it is led between rollers 28 and 29. The roller 28 is engraved with the desired design. A brush or roller 30, not affected by acid, dips into a receptacle 31 containing acid 32, preferably concentrated sulphuric acid. A scraper 33 engages the surface of the roller 28 and removes from the plain portion of the surface thereof all of the acid which is applied thereto by the brush or roller 30. A small amount of acid remains in the engravings 34 and when these engravings pass in contact with the cloth the roller 29 forces the cloth into the engravings and causes a deposit of acid on the fibres of the cloth and only on the parts of the cloth corresponding to the design of the roller. A backing paper or cloth 35 is placed between the roller 29 and the cloth to catch any excess acid. This paper therefore acts to keep the surface of the roller 29 free of acid. The paper 35 passes only once through the rollers 28 and 29 and is not ordinarily re-used. The cloth 13^a is led down over the guide 15^a into contact with the material 19^a on the belt 3^a. It then proceeds between the rollers 2^a and 6^a, whereupon printing material is passed from the engravings 20^a through the cloth at the parts surrounding the designs placed thereon by the roller 28. It will be understood that the rollers 6^a and 28 are mechanically synchronized so that this action is guaranteed. Ordinarily the arrangement will be such that when the printing material is forced from the rollers 6^a through the cloth, a raised design will be placed on the cloth. This design will not only act as an ornament but will also prevent raveling of the cloth where the acid has destroyed the fibre. There may be occasions when it will be desired to omit the raised character of the design and merely apply a cementing material the same color of the cloth, or other color, around the parts which have been attacked by the acid. In this latter case it would not be necessary to use as deep engravings on roller 6^a, nor would it be necessary to use the comminuted material 19^a, but instead of a backing of cloth, paper or any desired material may be used. When etching with this acid paint, it should be understood that the engraved rollers, color

troughs, color spreading rollers, doctor scrapers, etc., should be made of a material unaffected by the action of the acid, such as vulcanized rubber, glass, etc.

After the cloth has passed from the machine shown in Fig. 3, the design portions are partially destroyed by the acid and in order to complete the destruction of the fibres the cloth is preferably placed in a heating chamber and heated to any suitable temperature sufficient to dry out the acid and to char the parts of the cloth which have been attacked by the acid. The placing of the cloth in a heating chamber, however, is preferably not done until the cloth has stood over night with the acid thereon, although this time interval is not essential. After the heat treatment above mentioned, the cloth is run through any suitable brushing machine to remove therefrom the destroyed and charred parts so that all those portions to which the acid was applied will be entirely removed, thus producing openings in the cloth which are surrounded either by the raised design or by some suitable cementing material for the purpose of preventing raveling of the cloth.

An example of a design made from the machine of Fig. 3 is shown in Fig. 5. In this design the part 36 is an opening and the part 37 is the cementing material surrounding the opening and the part 37 may or may not be raised, as desired.

From the foregoing description it will be evident to those skilled in the art that my invention has many advantages, particularly because of the fact that any desired height or design may be produced; no smearing or running of the printing material occurs; the designs are efficiently attached to the cloth; the designs may be printed in multi-colors; openwork designs may be produced and raveling of the cloth prevented; any desired character of comminuted material may be used to form the body of the designs; only that part of the comminuted material which is actually cemented by the printing material is used, whereas the excess material is returned for further use; the machine for making the designs is simple and easily operated and the process is continuous. Other advantages will be apparent to those skilled in the art.

I claim:

1. The method of applying raised designs to cloth which consists in forcing an adherent medium through the cloth into contact with a material of a character adapted to be cemented by the adherent material and form the design.

2. The method of applying raised designs to cloth which consists in applying an adherent material from one side of the cloth and forcing said adherent into comminuted material on the other side of the cloth,

whereby the two materials combine to form the design.

3. The method of applying raised designs to cloth which consists in forcing adherent material through the cloth into comminuted material adapted to combine with the adherent material to form the design.

4. The method of applying designs to cloth which consists in continuously forcing adherent material in design form through the cloth into material adapted to receive the adherent material and with said material form the design.

5. The method which consists in filling the engraved designs of a roller with adherent material, pressing cloth against the roller through a layer of comminuted material adapted with the adherent material to form raised designs on the cloth.

6. The method which consists in forcing a fluid adhesive in design form through cloth into absorbent material adapted when

mixed with said adhesive material to form raised designs on the cloth.

7. The method of forming raised designs on cloth which consists in passing an adherent material through the cloth from a design member into an absorbent material to form the body of the design.

8. The method of forming raised designs on cloth which consists in passing the cloth between two rollers, one of which has the designs thereon, forcing adherent material from the design roller through the cloth into flocculent material which adheres to the cloth to form the body of the designs.

9. The method of forming raised designs on cloth which consists in filling the engraved designs of a roller with an adherent material, forcing the material from the roller through the cloth into an absorbent material adapted to combine with the adherent material to form the designs.

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