July 7, 1942. N. P. ROBIE 2,288,649

MULTIPLE CLOTH BACKING FOR FLEXIBLE ABRASIVE ARTICLES

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Fig. 1.

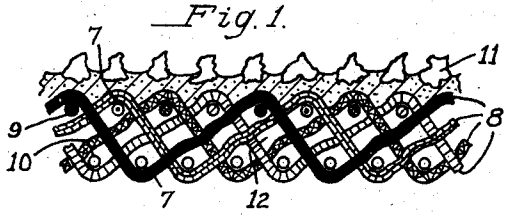


Fig. 3.

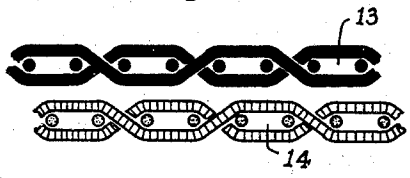


Fig. 2.

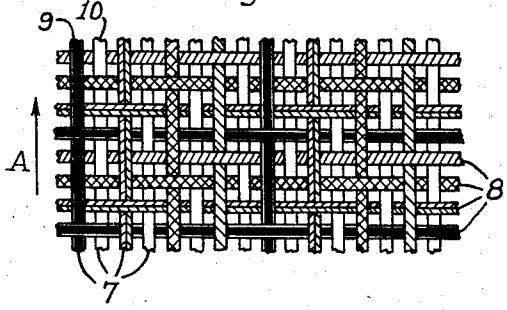


Fig. 4.

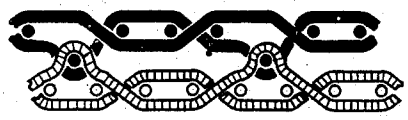


Fig. 5.

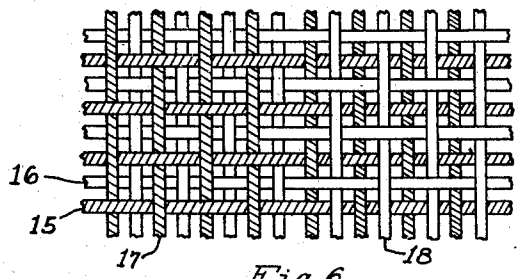
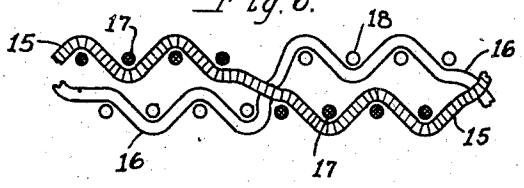


Fig. 6.



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Fig. 7.

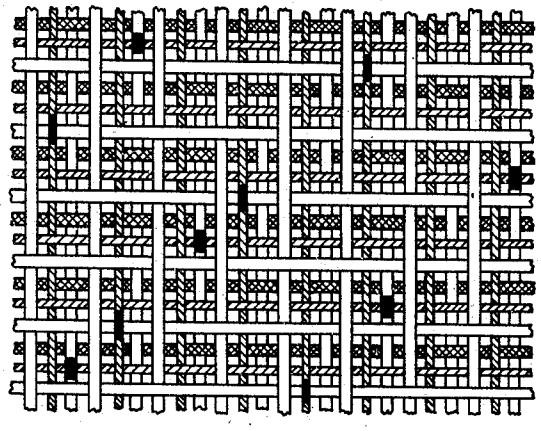


Fig. 8.

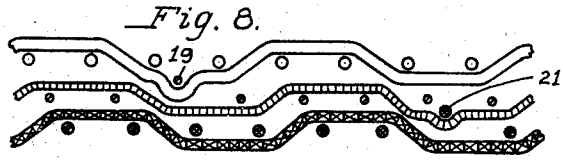


Fig. 9.

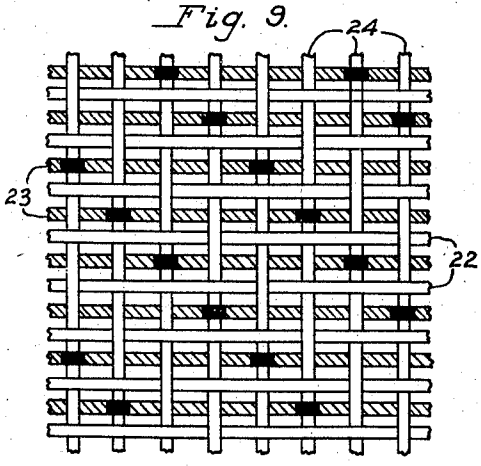


Fig. 11.

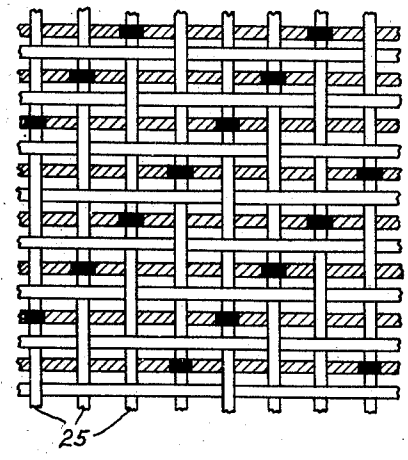


Fig. 10.

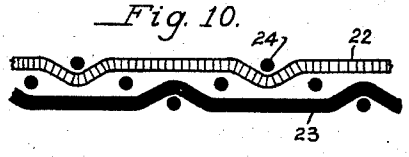
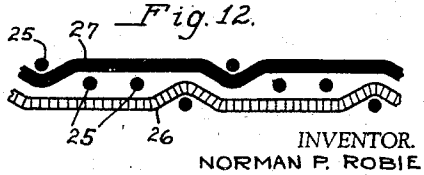


Fig. 12.



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MULTIPLE CLOTH BACKING FOR FLEXIBLE ABRASIVE ARTICLES

Norman P. Robie, Niagara Falls, N. Y., assignor to The Carborundum Company, a corporation of Delaware

Application January 27, 1939, Serial No. 253,162

4 Claims. (Cl. 51—297)

This invention relates to the manufacture of abrasive sheets for use in grinding discs, abrasive belts, and the like. The invention relates more particularly to multiple cloth backings or supports for abrasive discs or belts. While the type of backing for the working surface of an abrasive sheet as described in the present specification may be used for either abrasive discs or for abrasive belts, its use will be described particularly with respect to abrasive belts. It is highly desirable that an abrasive belt should combine great strength in the line of motion of the belt with the flexibility necessary to carry the belt around the cylindrical surfaces where the belt contacts with the supporting pulleys. It is desirable therefore to use a backing for the abrasive particles in which the tensile strength in the direction of travel of the belt is greater than the tensile strength in the direction of the width of the belt.

In accordance with one embodiment of the present invention the backing for the abrasive sheet may be made of a multiple cloth in which the double layer of threads running parallel to the direction of motion of the belt are very much stronger than the transverse threads.

The disclosure is illustrated by means of the accompanying drawings in which:

Figure 1 is an enlarged transverse section of an abrasive-coated sheet used to form an endless abrasive belt, the section being taken in a plane at right angles to the direction of motion of the belt;

Figure 2 is an enlarged plan view of the backing surface to which the abrasive coating was applied;

Figure 3 is an enlarged transverse section of two single cloths where each series of weft threads interweaves only its own warp threads;

Figure 4 is an enlarged transverse section of a double cloth formed from two single cloths of the type shown in Figure 3 with the threads of one cloth interweaving the threads of the other cloth;

Figure 5 shows an enlarged plan of another weave of double cloth;

Figure 6 is a view taken in a plan at right angles to that of Figure 5 to show the course in the weave of two of the threads indicated therein;

Figures 7 and 8 illustrate a treble cloth;

Figures 9 and 10 illustrate a backed cloth in which there are two series of warp threads and one series of weft threads; and

Figures 11 and 12 illustrate a backed cloth in which there are two series of weft threads and one series of warped threads.

Referring to the drawings in detail Figures 1 and 2 illustrate one embodiment of the present invention wherein the multiple cloth backing (of an endless abrasive belt) is much stronger in the direction of travel than across the direction of belt travel. The backing for the abrasive coating **11** is made of a multiple cloth **12** in which the threads **7** that are parallel to the direction of travel of the belt as indicated by the arrow A in Figure 2 are in a double layer and are much stronger than the transverse threads **8**. The strong threads **7** are shown in transverse section in Figure 1 as a double layer, the upper layer **9** just under the abrasive coating and the lower layer **10** parallel to and below layer **9**. The transverse threads **8** weave the double layer of threads **9** and **10** together.

The direction in which the belt is run and in which the threads **7** run may be called the longitudinal direction and the threads **7** the longitudinal threads. The thinner threads **8** may be called the transverse threads.

The difference in strength of multiple cloth similar to that shown in Figures 1 and 2 in the longitudinal and transverse directions is well illustrated by the following table. The three specimens differ in weight and number of threads per unit area.

Specimen No.	Longitudinal strength direction of belt travel	Transverse strength
1	166	72
2	161	46
3	189	94

The longitudinal strength of these specimens of multiple cloths was 100% or more greater than the transverse strength. Still another advantage of these multiple cloths is that its resistance to stretch is much greater in the longitudinal direction or direction of belt travel. Thus the higher strength and higher resistance to stretch in the direction of belt travel make these multiple cloths eminently suitable for endless abrasive belt backings.

In Figure 3 there is shown an upper or face layer of cloth **13** in which a series of weft threads is interwoven only with its own series of warp threads. The backing layer **14** is woven in a similar manner. Two distinct fabrics are formed one above the other by independent movement

of the two series of weft threads through its own series of warp threads. In Figure 4 on the other hand a double cloth is shown in which the face layer and backing layer are tied together by means of the two threads which are represented by solid black circles and which lie below the other five solid black circles.

Figures 5 and 6 illustrate a double cloth weave in which the threads 15 and 17 are in the face layer in the left portions of these views and are in the backing layer on the right side of these views. The threads 16 and 18 are shown in the backing layer on the left side and in the face layer on the right side.

Figures 7 and 8 show a treble cloth in which the upper or face layer is composed for the most part of light colored threads while the bottom layer is composed of dark colored threads. The intermediate layer is composed for the most part of threads which are shown as smaller in diameter merely to make it easier to distinguish the intermediate layer. The three layers are tied together by occasional intermingling of threads of the intermediate layer with those of the upper layer and by intermingling of threads of the bottom layer with those of the intermediate layer. This is illustrated by means of the threads 19 and 21 in Figure 8.

Figures 9 and 10 illustrate a warp-backed cloth in which there is one series of weft threads 24 and two series of warp threads indicated by the reference characters 22 and 23 respectively.

Figures 11 and 12 illustrate a weft-backed cloth in which there is one series of warp threads 25 and two series of weft threads denoted by the reference characters 26 and 27 respectively.

In order to increase the surface of contact between the adhesive and the cloth the threads of the cloth may be roughened with sandpaper or the like.

This invention is not limited to multiple cloth backings containing unequal strengths in the longitudinal and transverse directions. For the manufacture of sanding discs, we prefer to use a thick strong multiple cloth with equivalent strengths in the longitudinal and transverse directions. This cloth is filled with suitable sizing adhesives to strengthen and stiffen it and may or may not be further reinforced by cementing fiber or paper board layers to the cloth.

The term multiple cloths, as used in this specification, includes backed cloths containing an extra series of either warp or weft threads, and double or treble cloths wherein several cloth layers are combined by means of common threads interweaving them together. The term is also taken to include backed and double cloths containing extra wadding threads of thick yarn to increase the weight and thickness of the cloth. Broadly the term is taken to include any cloth wherein additional threads are introduced over and above the usual warp and weft threads of the plain single cloths heretofore used as flexible coated abrasive backings.

The multiple cloths as herein defined are characterized in that they make possible a thicker, heavier and stronger cloth than is possible with a single cloth structure with threads of equal size. A heavy strong single cloth can only be made by using thick yarns, in conjunction with which it is necessary to employ few threads per unit area. On the other hand a thick, strong multiple cloth can be made with finer yarns and more threads per unit area which provides a smoother more closely woven surface whose pores are easier to fill with sizing and whose smooth surface is easier to coat with abrasive particles.

The varieties of multiple cloths capable of being produced by the textile industry are exceedingly numerous and many of them are of no value to us for the purposes of this invention, for some of them are designed for the purposes of presenting a pleasing design, of providing thickness for warmth, and for the purpose of backing high quality threads with cheaper threads.

The varieties of multiple cloths in which we are interested for the purposes of this invention are those which provide added strength in one or all directions, those which provide thickness and strength without thick coarse threads, and those which provide thickness in a single cloth structure capable of absorbing large amounts of stiffening reinforcing adhesive sizing.

It is not intended to limit the multiple cloths useful as abrasive backings to the weaves shown in the drawings, as many others of equivalent usefulness are possible. The relative strength and thickness of the warp and weft threads or the face and backing threads may be varied widely. Further many changes may be made in the character of the abrasive and of the binder without departing from the spirit of the invention which is defined in the compass of the following claims:

I claim:

1. A flexible abrasive article comprising a layer of abrasive particles bonded to a backing of multiple cloth made up of a plurality of layers of parallel longitudinal threads and of transverse threads which draw the multiple layers and the parallel longitudinal threads close together, in which the strength of the cloth is substantially greater in a direction parallel to the longitudinal threads than in a transverse direction.

2. An abrasive belt comprising a layer of abrasive particles bonded to a backing of multiple cloth in which the parallel threads constituting the principal threads of the parallel layers of cloth are disposed parallel to the direction of motion of the belt.

3. The flexible abrasive belt described in claim 2 in which the strength of the sheet per unit length is at least fifty per cent greater in a direction parallel to the longitudinal threads than in a transverse direction.

4. A flexible abrasive belt comprising a layer of abrasive particles adhesively attached to a backing of multiple cloth in which the stronger threads of the parallel layers of cloth lie parallel to the direction of travel of the belt.

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