Feb. 2, 1954 P. CHRISTMAN 2,667,822

WALLBOARD TAPE

Filed Sept. 6, 1951 3 Sheets-Sheet 1

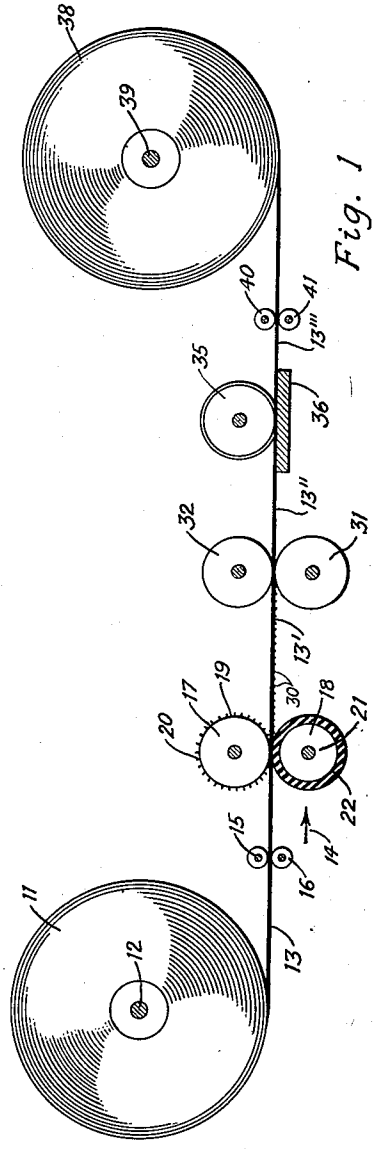


Fig. 1

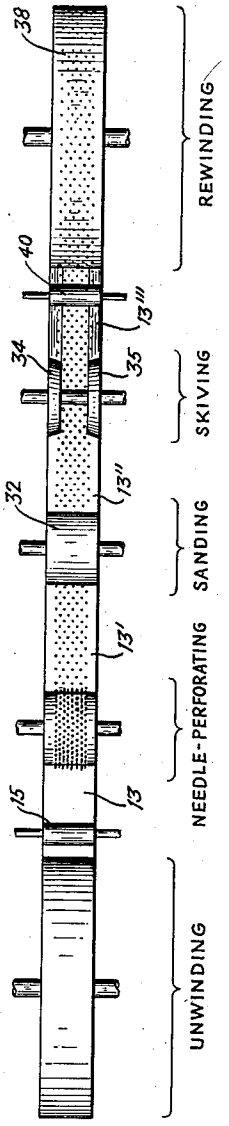


Fig. 2

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Feb. 2, 1954 P. CHRISTMAN 2,667,822

WALLBOARD TAPE

Filed Sept. 6, 1951 3 Sheets-Sheet 2

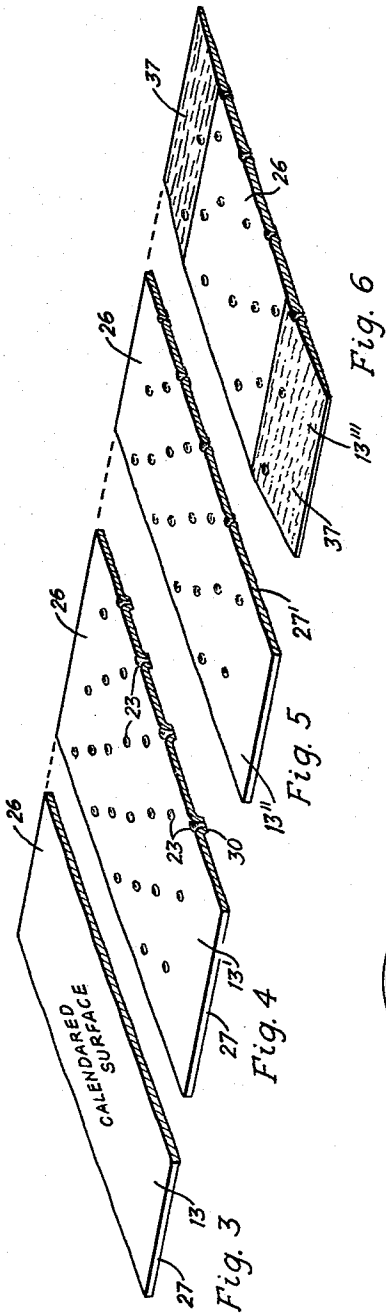


Fig. 6 Fig. 5 Fig. 4 Fig. 3

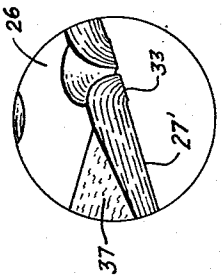


Fig. 9

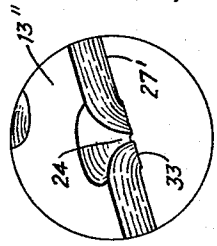


Fig. 8

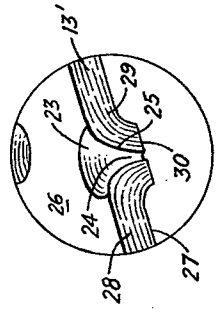


Fig. 7

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Feb. 2, 1954 P. CHRISTMAN 2,667,822

WALLBOARD TAPE

Filed Sept. 6, 1951 3 Sheets-Sheet 3

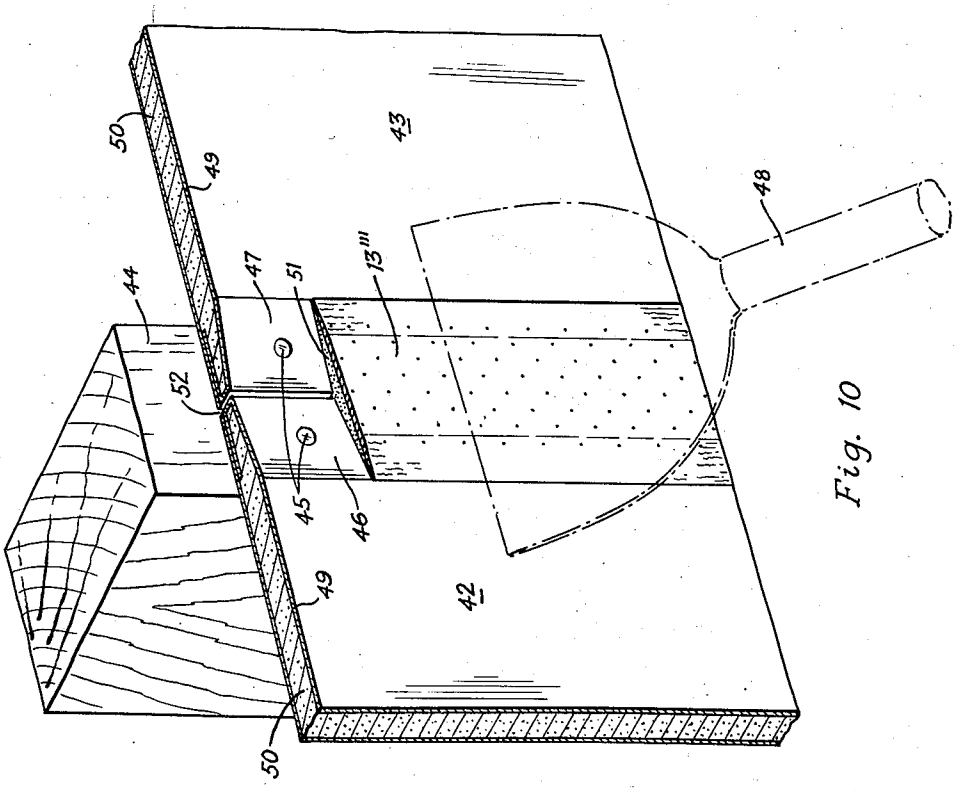


Fig. 10

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UNITED STATES PATENT OFFICE

2,667,822

WALLBOARD TAPE

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Application September 6, 1951, Serial No. 245,389

2 Claims. (Cl. 93—1)

1

This invention relates to improvements in wall board tape and provides a novel form of tape, as well as a method of making it, resulting in reduced cost of manufacture, reduced cost of installation and a better joint than attainable with conventional forms of wall board tape.

Wall board tape is primarily used in dry-wall construction in order to produce a smooth, generally invisible joint between abutting wall board panels, suitable for subsequent painting or wall papering.

In dry wall construction, wall panels of standard dimension are nailed to the studs, preferably in such a way, that adjoining panels abut over a stud. Wall board panels are generally slightly tapered along the long edges and the nails are driven through the board into the stud within the tapered portions. A joint compound is then applied over the abutting tapered portions with a broad knife which is drawn along the joint so as to produce a compound surface which is substantially flush with the non-bevelled surface portion of the abutting panels.

A length of wall board tape is then applied over the compound simply by placing it over the compound and drawing the broad knife over the tape, causing the back surface of the tape to adhere to the compound. In order to permit air bubbles to escape from behind the tape, conventional wall board tape is perforated with the exception of the edge portions. The edges are generally skived in order to make the edges of the tape inconspicuous.

The perforations in conventional wall board tape are produced by punching, and each hole has a diameter of the order of between $\frac{1}{16}$ and $\frac{1}{32}$ of an inch. As the broad knife is drawn over the tape in order to press the tape into engagement with a compound, the compound is compressed to some extent, as the flexible blade of the broad knife passes along the tape. The pressure thus produced causes a certain amount of compound to flow through the perforations behind the edge of the moving broad knife. The compound which passes through the holes forms pimples which then harden and can only be removed by sanding.

Repeated passage of the broad knife over the tape in order to remove the pimples before hardening does not produce a perfectly smooth surface, since each time pressure is built up in the compound underneath the knife edge causing further compound to flow through the perforations immediately after the edge of the knife has passed. The pimples, however small, are conspicuous, particularly if the wall is painted, unless they are removed by sanding. Sanding is a time consuming and dusty special operation which increases construction cost.

Attempts have been made to eliminate the

2

formation of compound pimples by reducing the size of the perforations to such an extent that compound is prevented from passing through the perforations, while yet leaving the tape sufficiently pervious to permit trapped air to escape. In this connection it has been proposed to form the perforations in the tape by electric discharges. The resulting tape is called "spark tape" in the trade and is quite effective in preventing passage of compound through the perforations. The main difficulty in the manufacture of spark tape, however, is the relative slowness with which the perforations can be produced. If the tape is advanced at too rapid a rate, the holes, instead of being round become elongated, or even become slits, which is objectionable. The "sparking" of the tape thus becomes the slowest step in its manufacture, subsequent steps, such as skiving of the edges, being operations which can be produced at a much faster rate.

The invention provides a novel form of wall board joint tape with perforations small enough to prevent the passage of compound therethrough, but capable of being produced at a considerably faster rate than the spark tape, the operation of perforating being carried out as rapidly as the tape can be skived.

The resulting tape has numerous physical characteristics which make it superior to other forms of tapes now in existence, as will be pointed out hereinafter. These characteristics generally contribute to the formation of a more secure bond of the tape to the compound, greater ease of application and an even less conspicuous joint than is produceable with conventional tape, particularly in instances where a joint is to be produced between non-bevelled board edges.

These and various other objects, features and advantages of the invention will appear more fully from the detailed description which follows, accompanied by drawings showing, for the purpose of illustration, a preferred embodiment of invention and steps in the method of producing it. The invention thus consists in certain new and original features of construction as well as new and original steps and sequences of steps hereinafter set forth and claimed.

Although the characteristic features of this invention which are believed to be novel will be particularly pointed out in the claims appended hereto, the invention itself, its objects and advantages, and the manner in which it may be carried out may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part of it in which:

Figure 1 is a diagrammatic elevational view illustrating steps in the production of the novel tape;

Figure 2 is a diagrammatic plan view of Figure 1;

Figures 3 to 6 are perspective views of portions of tape at the various stages of manufacture;

Figures 7 to 9 are greatly enlarged sectional views of portions of the tape shown in Figures 4 to 6 respectively; and

Figure 10 is a perspective view illustrating one mode of application of the wall tape.

In the following description, and in the claims, various details will be identified by specific names for convenience. These names, however, are intended to be as generic in their application as the art will permit. Corresponding reference characters refer to corresponding parts in the several figures of the drawings.

In the drawings accompanying, and forming part of, this specification, certain specific disclosure of the invention is made for the purpose of explanation of broader aspects of the invention, but it is understood that the details may be modified in various respects without departure from the principles of the invention, and that the invention may be applied to other forms of tape than the one shown.

Wall board tape is generally of a width of the order of two inches, it being obvious that narrower or wider tape can be used where special circumstances call for it.

A reel of tape 11 is supported on a shaft 12, and tape 13 is withdrawn from the reel in the direction indicated by the arrow 14.

The tape 13, at this stage, is a parallel-edged strip of paper stock, generally calendered to a relatively smooth surface on both sides.

The tape 13, after passing between guide rollers 15 and 16, passes into the nip of a needle point perforator consisting of a needle roller 17 and a pressure roller 18 urging the tape against the surface of the needle roller. The needle roller preferably is a metal roller beyond the surface 19 of which individual needles 20 project slightly. A good grade of phonograph needle is quite suitable for this purpose.

The pressure roller 18 preferably has a metal core 21 over which a facing 22 of a resilient material is applied. Natural or synthetic rubber are suitable as facing. The life of the rubber is surprisingly long even though the needles extend into it slightly as the tape 13 passes through the nip.

The needles are so set that, as the tape passes through the nip of the rollers 17 and 18, the needles pierce the tape and extend slightly into the resilient facing of the pressure roller 18.

Thus, the tape 13' leaving the nip of the rollers 17, 18 has many small perforations extending through it. Referring to Figures 4 and 7, it is seen, that the perforations are unique, in that no stock is actually removed from the tape. In distinction, each perforation is bounded by a depression 23 from which a more or less funnel-shaped aperture 24 extends. The walls 25 of the funnel are produced by a displacement or upsetting of the surrounding paper fibers.

The paper fibers of the stock remote from the perforation are substantially parallel to the surfaces 26 and 27. In distinction, the upset fibers have a greater normal component of direction with respect to the tape surface. This is illustrated in Figure 7 where the direction of the undisturbed fibers is indicated at 28 whereas upset fibers are indicated at 29.

Since the formation of the apertures amounts to a local deformation of the paper stock, the displaced stock appears in the form of a substantially annular protuberance 30 rising slightly above the back surface 27 of the tape.

These protuberances are removed or reduced in the next operation. For this purpose the perforated tape 13' is passed over a sander 31, against which the tape is urged by a pressure roller 32. The sanding roller 31 practically removes the protuberances 30 from the back surface of the tape. However, if the tape is examined closely, particularly under a magnifying glass, a small annular area 33 is noticeable around each aperture 24. The actual height of this area over the back surface is microscopic, and the area 33 is noticeable primarily because of the change in direction of the fibers.

The sander is so constructed and adjusted that it not only reduces the protuberances 30 but also uniformly roughens the back surface 27 to produce a ground back surface 27'. The ground surface area 27' remote from the apertures 24 appears to have a slightly different texture than the area 33. This is mainly due to the fact that fibers remote from the aperture 24 lie substantially parallel to the back surface and are roughened or loosened, whereas the fibers lie more or less normal within the area 33 where they are cut off substantially at right angles to the direction of the fibers. This primarily produces the annular raised appearance of the area 33, when the tape is viewed from the back.

The perforated and ground tape 13'' is then skived to reduce the thickness of the edges of the tape. This skiving may be done in various ways, but the preferred manner of skiving is by means of two grinding wheels 34 and 35. The wheels 34 and 35 are dressed to a slight taper as shown with considerable exaggeration in Figure 2. A pressure plate 36 properly spaces the tape from the surface of the wheels 34 and 35, a preferred adjustment being that in which the thickness of the tape is reduced to about one-half at the edges. Thus, a ten-caliper tape is skived to five-caliper at the edges. The skiving operation also uniformly roughens the top surface of the tape within the skived areas 37, but the center area of the tape 26 remains smooth and calendered.

The tape 13''' is then rewound on a rewinding reel supported on a shaft 39. The tape 13''' may pass between guide rollers 40 and 41 on its way to the rewinding reel.

Considering now the use of the tape, its physical characteristics and its advantages, a typical installation is shown in Figure 10. Two wall board panels 42 and 43 are nailed to a stud 44 by nails 45. The wall board panels closely abut, or are slightly spaced at 52, it being immaterial whether a small space remains between the edges of the panels, since any space at this point will be filled with a joint compound. The wall panels 42 and 43 are shown as having tapered edges 46 and 47.

After the nailing of the panels, a joint compound is applied over the tapered areas 46 and 47, preferably with a broad knife 48. The compound generally is a water-mixed composition which, during application, has the consistency of putty, and which, after several hours, hardens to a stone-like substance. The compound adheres well to paper, such as the paper ply 49 of the wall board. The compound also adheres well to the core material 50, in the event a portion of the paper ply is removed, as it happens along the edges of a cut panel.

The surface of the compound 51 is made substantially flush with the surface of the panels 42 and 43, before the tape 13'' is applied. The surface of the compound may be made slightly convex, plane, or slightly concave, depending on the force exerted on the thin and flexible broad knife. Greater pressure naturally tends to make the surface of the compound concave. Slight concavity is quite desirable as it compensates for the thickness of the tape to be applied.

The joint tape 13''' is then applied by pressing it with its back surface against the soft compound. The roughened back surface 27' of the tape adheres extremely well to the compound as the tape is pressed into adhesive engagement with the compound by the broad knife.

The force of the blade, and the resultant pressure locally built up in the compound does not cause the compound to flow through the apertures. This is due to two reasons:

Firstly, the apertures are small. Secondly, the area 33 immediately adjacent each aperture appears to have capillary properties tending to withdraw a certain amount of moisture from the compound which would tend to flow through the aperture. This promotes more rapid setting of the compound at the apertures and effectively stops the flow of compound into and through the apertures.

Thus, the formation of compound pimples is effectively prevented and a subsequent sanding operation of the tape joint is made entirely unnecessary.

Frequently, joints must be made between non-tapered edges of panels, particularly where cut panels are used. Reduced panel widths are usually produced by scoring the wall board and then breaking it along the score line.

Joints of non-tapered edges are naturally thicker than the board itself. In order to make such joints as inconspicuous as possible, it is good practice to make the joint considerably wider than a joint between tapered edges. Tape of the same width is used for such wide joints, but a certain amount of compound is applied to either side of the tape in order to produce a surface which tapers so gradually into the surface of the panels as to be imperceptible. In joints of this type it is naturally desirable to keep compound from adhering to the center portion of the tape where the joint is thickest. The smooth calendered surface portion 26 of the tape 13'' is readily stripped clean of compound by passage of the broad knife over it. However, the compound adheres readily to the skived areas 37, where it is desired to adhere in order to form a gradually tapered surface merging into the surface of the wall board at some distance from the joint proper.

It is thus seen that the physical qualities of the novel tape are very advantageous. Among these properties are:

The smallness of the size of the perforations;
The capillary characteristics within the area 33;
The uniformly roughened back surface 27';
The uniformly roughened front areas 37; and
The smooth calendered center area 26.

The novel tape is very economical to produce since the tape can be perforated as fast as it can be ground and skived. The production rate attainable with a new tape is therefore considerably higher than the production rate of spark tape.

Obviously, the present invention is not limited to the specific form disclosed nor to the specific sequence of steps illustrated and described. Various details may be modified and various additions, omissions, substitutions or other changes made without departing from the spirit of the invention.

What is claimed is:

1. A paper tape for wall board joints, comprising a substantially parallel-edged strip of paper having a front surface and a back surface, the front surface having a smooth raised center portion along which the fibers lie flat with respect to the tape surface, and tapered edge portions to either side of the center portion along which the surface is rougher than at the center portion so that, within the edge portion, surface fibers, at least in part, stand up with respect to the tape surface, the thickness of the tape decreasing towards the edges from the raised center portion, the back surface being flat from edge to edge and having a rough finish across its entire width so that surface fibers, at least in part, stand up with respect to the back surface, the tape having pin prick perforations therethrough, each perforation being characterized by a depression around the perforation, said depression extending from the front surface, the direction of the fibers immediately surrounding each perforation having a greater normal component with respect to the tape surface than fibers remote from the perforation, the fibers surrounding each perforation terminating in a plane substantially parallel to the back surface of the tape.

2. In the method of converting paper tape into wall board joint tape, the steps, which comprise, pin-pricking the tape at spaced points to displace, without punching out of stock, the paper fibers which normally extend substantially parallel to the tape surface into a new direction in which such displaced fibers, at least in part, have a greater normal component of direction with regard to the tape surface than fibers not so displaced, such displacement of the fibers breaking the continuity of the tape surface resulting in holes which on one side are characterized by a cavity with respect to the tape surface and on the opposite side by an annular protuberance of displaced fibers; flat grinding the opposite surface from edge to edge to roughen it and to reduce said protuberances; and then grinding a marginal strip of the one surface along each edge at an angle to the central portion of said one surface to feather the edge, leaving the surface between said marginal strips undisturbed.

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