July 21, 1953 M. F. SKALMUSKY ET AL 2,645,937

METHOD OF TESTING SHEET MATERIALS

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Fig. 1

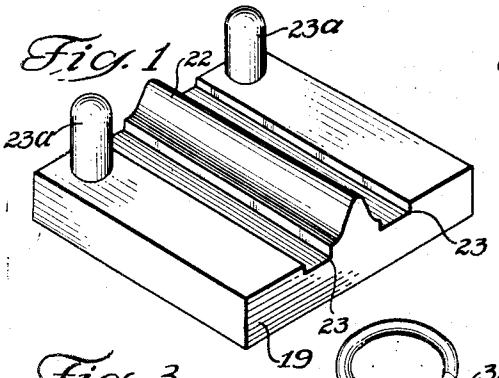


Fig. 2

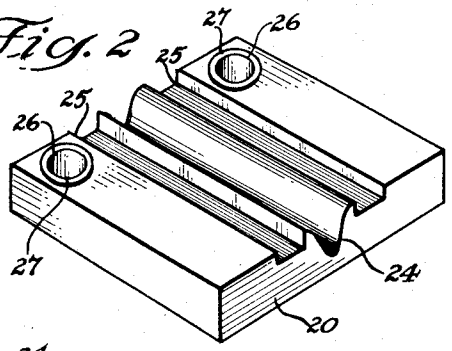


Fig. 3

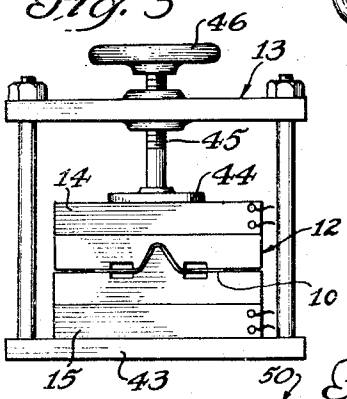




Fig. 4

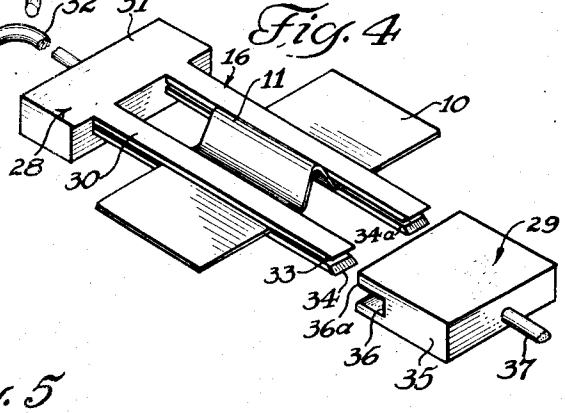


Fig. 5

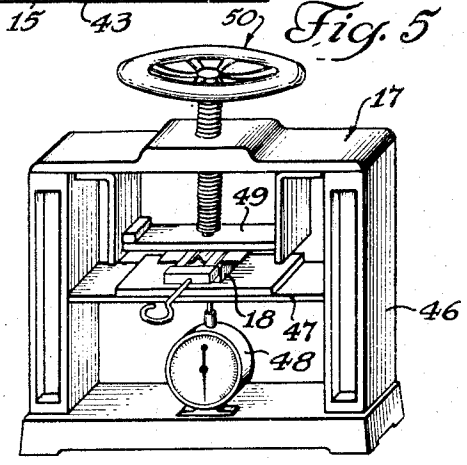


Fig. 6

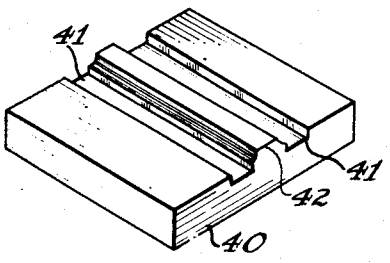


Fig. 8

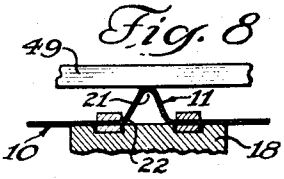
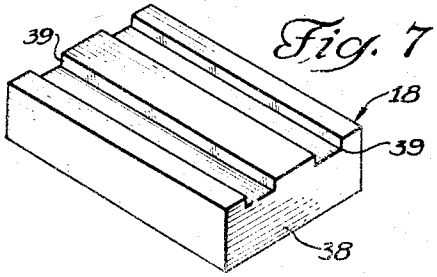


Fig. 7



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METHOD OF TESTING SHEET MATERIALS

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1 Claim. (Cl. 73—94)

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The present invention relates to the measurement of various characteristics of paperboard or other similar material and, more particularly, it relates to a method of predicting the characteristics of a paperboard as a corrugating medium.

One of the more important ways of using paperboard and some similar materials is by corrugating the material and fabricating it into paper boxes, using it for packaging, etc. Due to the fact that the material is corrugated, it has been found that the usual tests, e. g. tests relating to tear and strength, do not indicate the desirability of a specimen of material as a corrugating medium. In this connection, it would be commercially desirable to provide simple laboratory or field tests which will give an accurate indication of the applicability of a specimen of material as a corrugating medium so that the determination may be made without the use of large corrugating machines or other expensive apparatus.

The principal object of the present invention is to provide an improved method of evaluating sheet material in respect of its use as a corrugating medium. A further object of the invention is the provision of means of the character described which is speedy, economical, and practical. Other objects and advantages of the invention will become clear by reference to the accompanying description and drawings.

In the drawings:

Figures 1 and 2 are isometric views showing cooperating die members constructed in accordance with the invention;

Figure 3 is an elevational view illustrating a mechanical press for forcing the die members together;

Figure 4 is an isometric view of a fork and keeper which are adapted to rigidly hold a fluted specimen of sheet material;

Figure 5 is an isometric view of a machine for evaluating the use of the sheet material as a corrugating medium;

Figures 6 and 7 are isometric views of two types of support for the fork shown in Figure 4; and,

Figure 8 is a fragmentary view, partially in

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section, showing a specimen of paperboard with relation to various operative parts of the testing apparatus.

In accordance with the present invention, a specimen or sample of material, such as 10, is formed to provide an elongated flute or corrugation 11. The flute 11 is then subjected to various measurable forces which may be applied generally perpendicularly to its apex (Fig. 8). We have found that the extent of the force required to break down, or cause the flute to collapse is indicative of the value of the material for use as a corrugating medium.

In order to form the flute 11 in the specimen 10, a shaping member or tool 12 is provided which may be inserted into any well-known type of press, as for example, the mechanical press shown at 13 in Figure 3. When corrugated paperboard is fabricated, it is frequently heated in the corrugating process and, accordingly, the shaping tool 12 is heated in the press 13 by suitable heating means comprising electrically energized thermal elements 14 and 15. As a result, the specimen 10 may be subjected to substantially the same conditions in forming the flute 11 as a board or larger section of the material would undergo when being corrugated in commercial processing.

After the flute 11 is formed, the specimen 10 is removed from the shaping tool 12 in a manner such that the flute 11 is not deformed, or subjected to strains or stresses which might affect the measurement of the corrugating characteristics of the specimen 10. This is accomplished by clamp means 16 which grasps the fluted specimen 10 in the shaping tool 12. The clamped specimen is then placed in a testing machine, such as 17 and shown generally in Figure 5, and the flute 11 is put under compression. The clamp means 16 should be placed in supporting means 18 in the machine 17 while the specimen 10 is being tested.

The shaping tool 12 comprises a punch die 19 and a matrix die 20 which are constructed so that they will form a flute of the desired shape in a specimen when interengaged with one an-

other. In the drawings, the dies, 19 and 20, are proportioned to form a generally V-shaped flute having a rounded apex 21 and diverged ends 22 which are curved, as shown in Figure 8. Accordingly, the punch die 19, which is preferably made of steel or other heat conductive material, includes a generally V-shaped ridge 22, having a rounded apex and curved edges. A pair of slots 23 are formed on each side of the ridge 22 and are located immediately adjacent the edges of the ridge 22. The punch die 19 further includes a pair of aligning studs 23a which are attached thereto for engaging the matrix die 20 to prevent damage to the specimen 10 and dies 19 and 20 when the flute 11 is being formed.

The matrix die 20 includes a recess 24 having complementary dimensions with respect to the ridge 22 formed in the punch die 19. Slots 25, similar to those formed in the punch die 19, are located in the matrix die 20 on either side of the recess 24 and holes or openings 26 are drilled in the die which are preferably lined with brass as shown at 27 in the drawing. The holes 26 are located so as to engage studs 23a and guide the ridge 22 into the recess 24.

As pointed out, the clamp means 16 grasps the specimen 10 without deforming the flute 11 and this is accomplished by fabricating the means 16 so as to positively clamp onto the specimen 10 prior to its removal from the shaping tool 12. Accordingly, the clamp means 16 comprises a fork or bifurcated section 28 and a keeper 29. The bifurcated section 28 includes a pair of leaved arms 30 which are disposed in parallel relation, a cross piece 31 which is attached to one end of each of the arms 30, and a handle 32. Each arm 30 includes a pair of superposed leaves 33 and 34 which are held by the cross piece 31 closely adjacent one another. The unattached ends of the leaves 33 and 34 are preferably tapered toward one another, as shown at 34a, to form a mouth and facilitate engagement of the fork 28 with the specimen 10 while in the shaping tool 12.

The keeper 29 includes a block section 35 having a clamping slot 36 formed therein. The slot, in the illustrated construction, has a tapered mouth 36a and is proportioned to engage the arms 30 of the fork member 28 and positively clamp the leaves 33 and 34 together along their length. For convenience, the keeper 29 also includes a handle 37.

The arms 30 are spaced apart so as to fit into slots 23 and 25 of the dies 19 and 20 and to grasp the specimen 10 along the edge of the flute 11. The leaves 33 and 34 are shaped and proportioned so as to prevent spreading of the flute 11 when held together by the keeper 29.

In order to prevent flexing of the arms 30, during testing, and bending of the specimen 10 transverse of the flute 11, and to more accurately test the sample 10, the clamp means 16 is placed in the holder 18 while the flute 11 is subjected to pressure in testing machine 17. The holder 18 may comprise a block, such as block 38, shown in Figure 7, having a pair of slots 39 formed in one face which are positioned to accommodate the arms 30 of the fork section 28 and proportioned so that it will only contain one of the leaves 33 or 34. As a result of this construction, the fluted specimen 10 is rigidly held upon a substantially flat surface (Fig. 8) and more accurate evaluation is possible.

Other supporting means 18 may be used, as for example a block 40 of the type shown in Figure 6. This block has a shape like that of the punch die 19 and includes slots 41, and a ridge 42 which is a truncated form of the ridge 22. The truncated ridge 42 is proportioned to extend above the arms 30 of the clamp means 16 when supported in the slots 41. As a result, when the flute 11 breaks down during the testing operation, the pressure of the testing machine 17 is not resisted by the arms 30 of the fork section 28 but by the truncated ridge 42.

The press 13, as before pointed out, may be of any well-known type, and includes a pair of pressure plates, such as 43 and 44, which plates may be urged together as by screw 45 and wheel 46 shown in Figure 3. Similarly, the testing machine 17 may comprise any suitable commercially available machine. As shown in the drawings, the testing machine 17 includes a frame structure 46, a platform 47 supported by a scale or indicator 48 and an adjustable pressure plate 49 which is actuated by a wheel and screw arrangement 50.

In order to determine the characteristics of a specimen of paperboard as a corrugating medium, the specimen 10 is placed intermediate the dies 19 and 20, and the thermal elements 14 and 15 are disposed between the dies 19 and 20 and the press 13. The shaping tool 12 is then heated and put under pressure so that the specimen is subjected to a pressure of from about 300 pounds per square inch to about 1500 pounds per square inch for about ½ to 10 seconds. The specimen should be heated to a temperature of from about 200° F. to about 350° F. While the dies 19 and 20 are under pressure, the fork section 28 is inserted in slots 23 and 25 so as to engage the specimen 10 and project from the opposite side of the shaping tool 12. The keeper 29 is then clamped onto the arms 30 so that the leaves 33 and 34 positively engage the specimen 10 therebetween.

After the flute has been formed, the specimen 10 is removed from the dies 19 and 20 by opening the press 13 and removing the thermal elements 14 and 15. The clamp means 16 is then placed in the holder 18 which comprises block 38, as shown in Figure 7. As a result, the flute is clamped to a substantially flat surface. The holder 18 and clamp means 16 are placed upon the platform 47 of the testing machine 17 and the pressure plate 49 is applied to the flute 11 (Figure 8). The scale 48 measures the point where the flute 11 collapses, which point is indicative of the value of the board, of which the specimen 10 is a sample, as a corrugating medium.

The fluted specimen 10 may also be subjected to an end-wise thrust and this may be done by removing the specimen from the dies 19 and 20 and placing it in suitable guides in the testing machine 17 so that the flute 11 extends vertically between the platform 47 and the pressure plate 49 of the testing machine 17.

In the foregoing we have described a simple and economical method of determining the applicability of various paperboards or like material as corrugating mediums. The apparatus described is particularly adapted for laboratory use and provides results which are truly indicative of the applicability of a sheet material as a corrugating medium.

The various features of the invention which are believed new are set forth in the following claim.

We claim:

A method of evaluating a sheet of material for use as a corrugating medium, comprising the steps of forming a single elongated flute, having

a cross section equivalent to the cross section of the flutes to be formed in the medium in a sample of the sheet, said flute having an apex which extends along its length, rigidly clamping the sample at the base of and along the edges of said flute, maintaining said edges in fixed relation and a portion outside of each of said edges in coplanar relation, and then applying a measurable compressive force to the apex of said flute and toward the plane of said portions until said flute collapses, said force being generally perpendicular to the plane of said portions.

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