April 18, 1961 H. P. ABBOTT 2,979,944

CARTON BOARD ADHESION TESTER

Filed Aug. 21, 1956 3 Sheets-Sheet 1

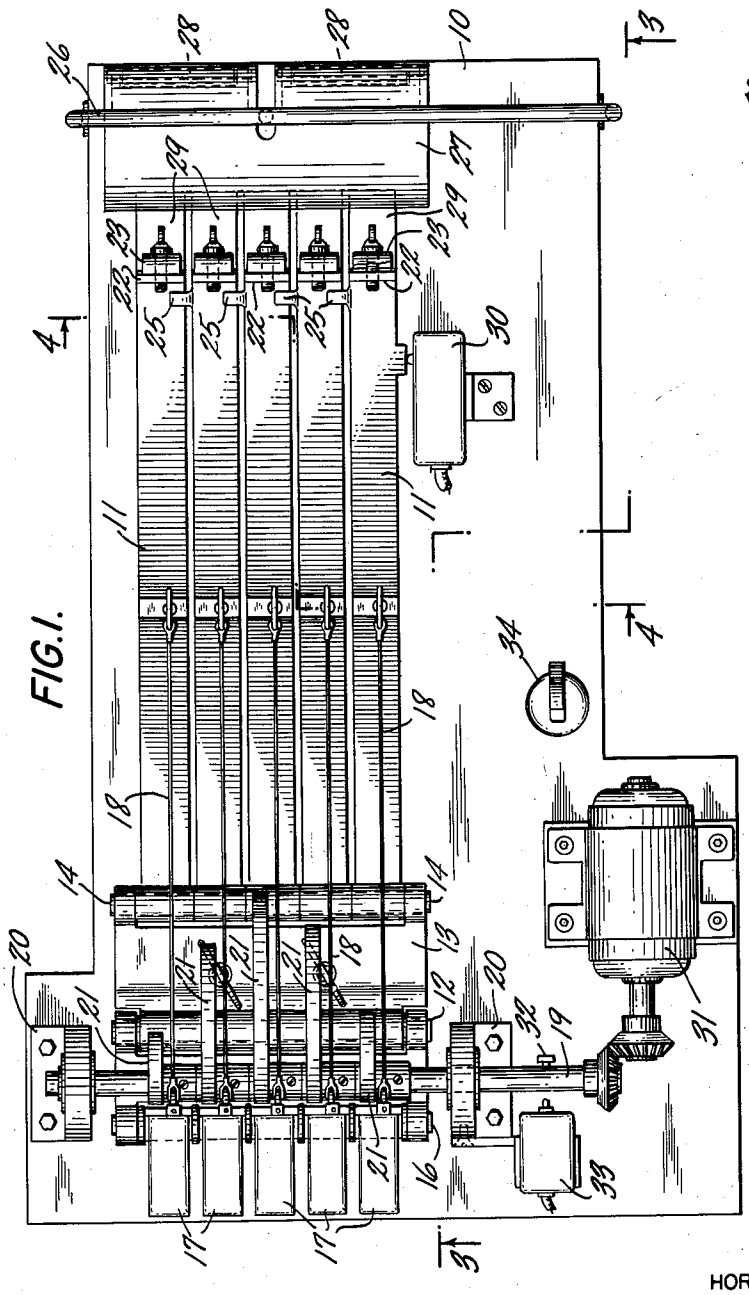


FIG. 1.

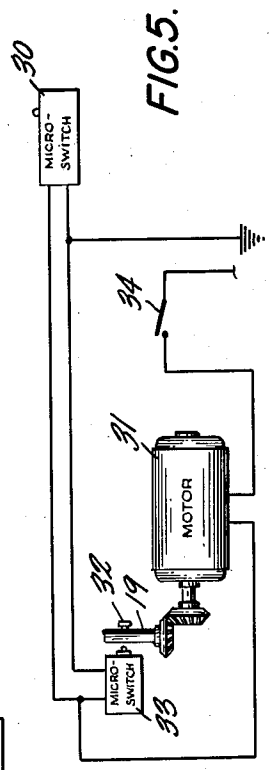


FIG. 5.

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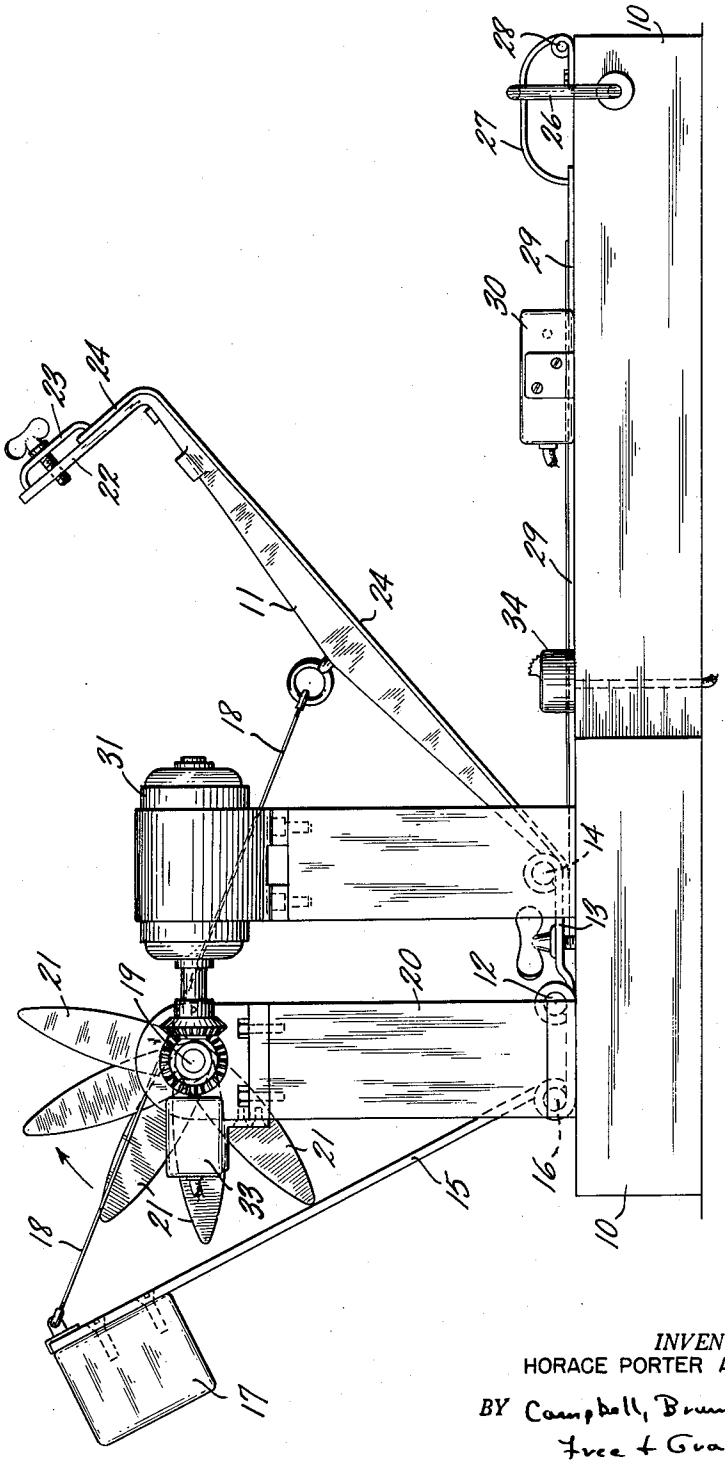


FIG. 2.

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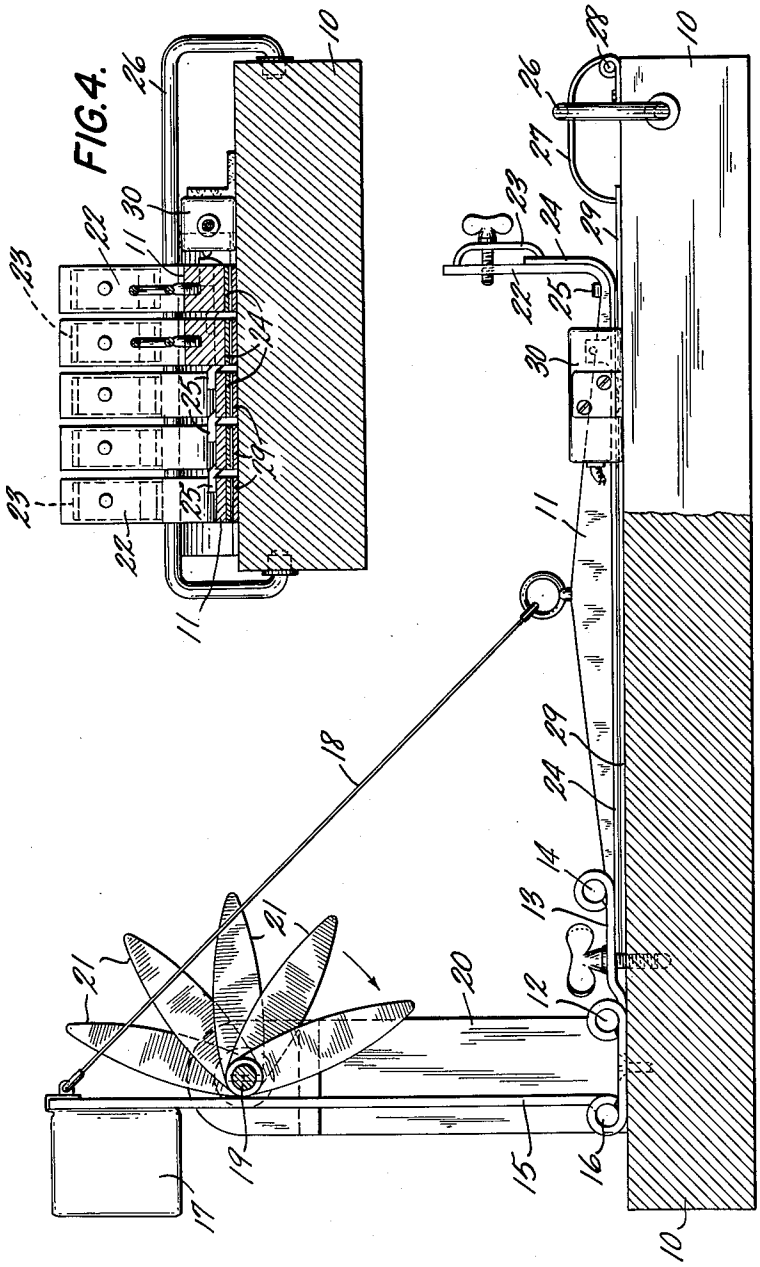


FIG. 4.

FIG. 3.

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CARTON BOARD ADHESION TESTER

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Filed Aug. 21, 1956, Ser. No. 605,374

4 Claims. (Cl. 73—150)

This invention relates to an adhesion testing device and particularly to an adhesion testing device for use in testing the adhesion characteristics of packaging materials in sheet form and of the glue with which the materials are joined. The device is adapted to perform a series of tests automatically over a series of time intervals following application of glue to a series of strips of sheet material.

Several devices designed to test the adhesion characteristics of various materials are presently available. One such device is designed to measure the force required to remove an adhesive tape from a paper surface after the tape has been applied with pressure. Other devices have been designed to separate two sheets or films which have been joined by adhesion, the object of these devices being to simulate the stress applied to the joined sheets during normal usage and to thereafter examine the separated sheets to determine visually the effectiveness of the adhesive employed. However, none of the prior art devices has been found suitable for automatically testing the adherability of glue and packaging materials such as carton board over a series of time intervals immediately following application of the glue.

The main object of the device of the present invention, therefore, is to simulate the normal stress applied to a sheet of packaging material such as carton board after being joined with an adhesive, and to test the adhesion characteristics of the adhesive over a series of time intervals immediately following application of the adhesive.

The above objects are realized by providing a device having a plurality of uniformly dimensioned weight clamps, each of which is adapted to receive a strip of the carton board or other material to be tested. Opposing each weight clamp is a base member on which a second strip of carton board may be attached. The weight clamps are hinged at a point adjacent one end of the parallel strips and are counterbalanced so that each weight clamp can be swung upwardly on its hinge with a minimum of effort.

Each weight clamp is separately counterbalanced for independent movement. A horizontal shaft bearing a plurality of cam members is provided adjacent the series of weight clamps. Each cam member is radially and laterally spaced apart on the shaft and arranged so that rotation of the shaft causes each cam member to sequentially engage a perpendicular arm bearing a counterweight and to swing a weight clamp upwardly on its hinge towards a vertical position. The cam members are arranged on the shaft so that during one revolution of the shaft, each of the cam members actuates and elevates a corresponding weight clamp in the series in sequence over a series of predetermined time intervals.

In operating the adhesion tester, one test strip in a pair of strips being tested is clamped to the under side of a weight clamp and the other test strip is clamped to the base member. Glue is applied to the contact surfaces of one or both strips. The weight clamps are then placed down on the base member, joining the strips to be tested, and starting the testing cycle of the apparatus. The strips are then separated through operation of this device over a series of time intervals, e.g., every 12 seconds, thus testing the effectiveness with which the strips are joined together. In the case of carton board, tearing of the fibers indicates good sealing.

These and other advantages of the present invention will become evident in the discussion of the accompanying drawings in which:

Figure 1 is a top plan view of the adhesive testing device of this invention;

Figure 2 is a side elevation of the adhesive testing device of this invention showing a weight clamp in raised position;

Figure 3 is a side elevation of the apparatus of Figure 1, taken along the view line 3—3, showing the weight clamp and counterweight in position for the start of testing;

Figure 4 is a cross-sectional elevation of a portion of the apparatus of Figure 1, taken along the view line 4—4; and

Figure 5 is a circuit diagram showing driving means and automatic switches for the adhesive testing device of the present invention.

For convenience, the description and operation of the testing device will be described with relation to its use with carton board and a standard glue, although it is understood that the device may be employed to determine the characteristics of any type of sheet material and any type of adhesive.

Referring to Figures 1 and 3, the adhesion testing device of the present invention comprises a base **10** on which a series of weight clamps **11** are arranged by means of a hinge **12** and clamp **13**. The clamp **13** is attached to the weight clamp **11** by means of an additional hinge **14**. Adjacent the clamp **13** are vertical arms **15** mounted on the base member **10** by means of hinges **16**. Vertical arms **15** support a counterweight **17**, and a suitable wire or cable **18** attaches the uppermost portions of the arms **15** with the weight clamp **11**.

A horizontal shaft **19** is disposed on support members **20** adjacent the upper portion of the vertical arms **15** on the side facing the series of weight clamps **11**. A series of opener cams **21**, one for each weight clamp **11** and vertical arm **15**, are attached to the shaft **19**.

Each weight clamp **11** is provided with an arm **22** at the end of the clamp **11** remote from hinge **14**. Each arm **22** is provided with a thumb screw clamp **23** adapted to receive and secure a sheet of test board **24**. Each weight clamp **11** in addition is provided with a latch **25**, so that all weight clamps **11** may be raised or lowered simultaneously if desired.

The test base **10** is provided with a swing latch **26**, a clamp **27** and a hinge **28**, the assembly being adapted to secure a test board **29** to the test base **10**.

The energizing circuit for the apparatus of this invention is best shown in Figure 5. A microswitch **30** is provided on the base member **10** and is adapted to be actuated by the first weight clamp **11** in the series when said weight clamp is placed on the base member **10**, as shown in Figures 1 and 3. The microswitch **30** energizes the driving means **31** which, in turn, rotates the shaft **19** and the cam member **21**. The shaft **19** has a projection **32** which opens a normally closed microswitch **33**. The projection **32** is so arranged that it contacts microswitch **33** when all of the weight clamps **11** have been raised. A switch **34** is placed on base member **10** to open and close the energizing circuit.

The adhesion testing device of this invention operates

substantially in the following manner. The weight clamps 11 are tilted upward on the hinge 14 to bring the vertical arms 15 and the counterweights 17 backward to the position shown in Figure 2. The thumb screw clamp 13 is loosened, as are the clamps 23 on the weight clamps 11 and the clamp 27 on the test base 10. Two pieces of test carton board of appropriate size are cut into five equal strips. Five of the strips are placed on the test base 10 of the device, so that each one lays directly under each of the five weight clamps 11 shown. One end of each strip is moved under the clamp 27, and the clamp 27 is fastened securely by the swing latch 26 to the base 10. The remaining five strips are positioned directly over the previously placed bottom strips, and one end of each strip is then attached to the surface of a weight clamp 11 by means of a thumb screw clamp 23.

A glue is then smeared uniformly to each of the five test strips which are attached to the test base 10. The tipped-up weight clamps 11 are pressed down so that the pieces of board attached thereto come in contact with the glued test strips on the base 10. Thumb screw clamp 13 is immediately tightened, so that both the upper and lower strips of board are held to base 10 by the clamp 13.

As soon as the weight clamps 11 fall into position, the normally open microswitch 30 closes and the electric motor 31 is actuated. The motor 31 rotates the horizontal shaft 19 and attached cam members 21. The cams 21 swing against the vertical arms 15 to raise the weight clamps 11. The cams 21 are spaced about the shaft 19 as shown so that rotation of the shaft 19 causes a cam 21 to engage an arm 15 of a weight clamp 11 approximately every twelve seconds. Thus, at the stated interval, a successive weight clamp 11 with attached carton board strip 24 is raised. At the end of a minute under these circumstances, all of the weight clamps 11 have been raised and an examination of the surfaces of the test pieces of board will show after which time interval the glue has successfully joined the pieces of board.

Thus, the adhesion tester of the present invention may be used to test samples of carton board in a uniform manner and to establish the ease with which they can be glued together with a standard glue. In addition, the relationship between samples of said board and board of unknown adherability may be tested. Also, the adhesion characteristics of various glues or other adhesives may be explored.

Any desired number of weight clamps 11 may be employed. The number five has been adopted here as giving a convenient number of samples over a given period of time. The intervals between which each clamp is lifted may, of course, be adjusted considerably, depending on the particular characteristics which the operator desires to test.

It will be understood that the above-described embodiment of the invention is illustrative only and that modifications will occur to those skilled in the art. Therefore, the invention is not to be limited to the specific apparatus disclosed herein but is to be defined by the appended claims.

I claim:

1. An apparatus for testing the characteristics of adhesives and of sheet materials to which the adhesives are applied, comprising a base member, a plurality of counterbalanced weight clamps, each weight clamp being pivotally mounted on said base, means for maintaining one test strip in place on said base, means on each of said clamps for maintainng a second test strip against the lower surface of said weight clamp and means responsive to the placing of said weight clamps on said base for automatically elevating each weight clamp in succession after an indicated time interval.

2. The apparatus of claim 1 wherein the means for automatically elevating each weight clamp in succession comprises a plurality of cam means arranged to cooperate with said weight clamps to automatically elevate each weight clamp in succession.

3. An apparatus for testing the characteristics of adhesives and of sheet materials to which the adhesives are applied, comprising a base member, a plurality of counterbalanced weight clamps, each weight clamp being pivotally mounted on said base, means for maintaining one test strip in place on said base, means on each of said clamps for maintaining a second test strip against the lower surface of said weight clamp, and means for automatically elevating each weight clamp in succession after an indicated time interval, said last mentioned means comprising a shaft supported above the base member, cam means arranged on said shaft, said cam means being radially and laterally spaced apart on said shaft, arm means for each weight clamp, said arm means being pivotally hinged on said base member and being adapted to elevate said weight clamp by cooperating with the said cam means during rotation of said shaft, driving means, starting switch means responsive to depression of the weight clamps for energizing the driving means, gear means responsive to the driving means for actuating the shaft, and means responsive to the elevation of the last weight clamps in the series for de-energizing the driving means.

4. An apparatus for testing the characteristics of adhesives and of sheet materials to which the adhesives are applied, comprising a base member, a plurality of counterbalanced weight clamps, each weight clamp being pivotally mounted on said base, means for maintaining one test strip in place on said base, means on each of said clamps for maintaining a second test strip against the lower surface of said weight clamp, and means for automatically elevating each weight clamp in succession after an indicated time interval, said last mentioned means comprising a shaft supported above the base member, cam means arranged on said shaft, said cam means being radially and laterally spaced apart on said shaft, arm means for each weight clamp, said arm means being pivotally hinged on said base member and being adapted to elevate said weight clamp by cooperating with the said cam means during rotation of said shaft, driving means, and gear means responsive to the driving means for actuating said shaft.

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