Jan. 2, 1934. J. I. NASMITH 1,941,484

APPARATUS FOR BENDING OR CREASING CARDBOARD, FIBER BOARD, OR THE LIKE

Filed Oct. 3, 1932 2 Sheets-Sheet 1

Fig. 1.

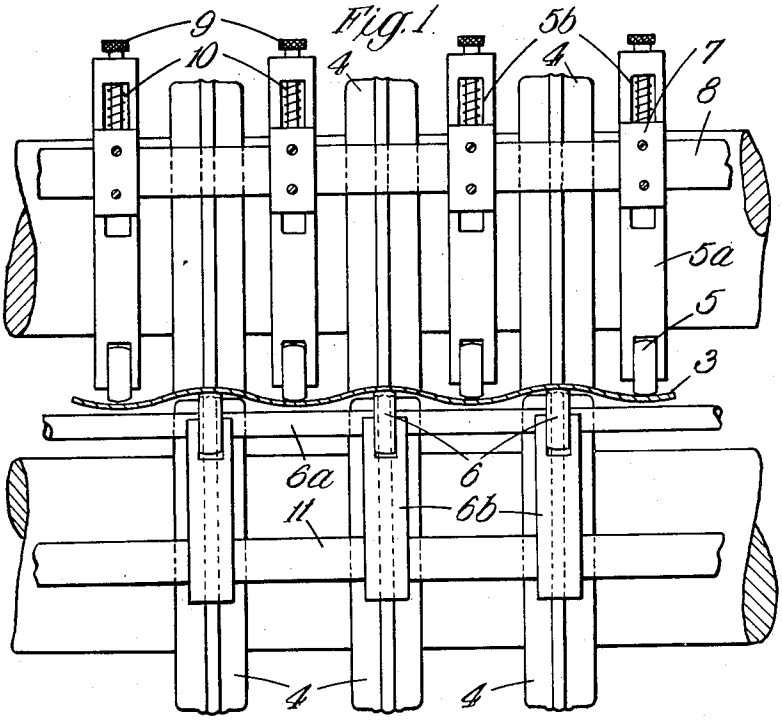

Fig. 2.

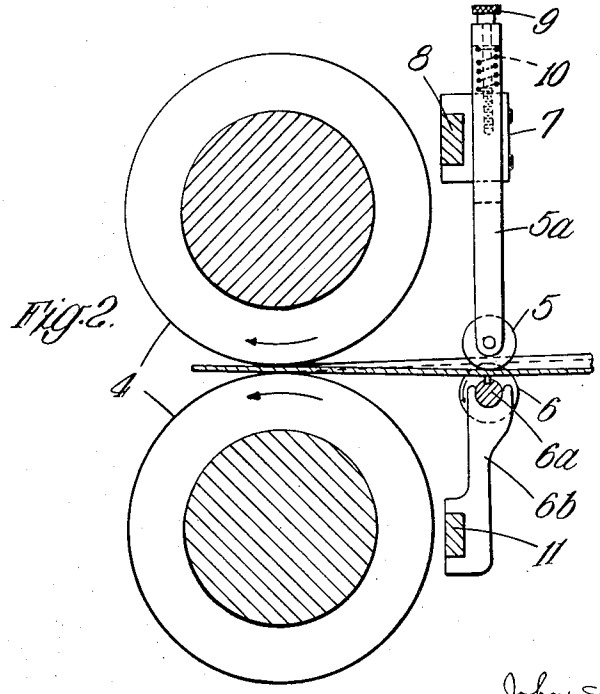

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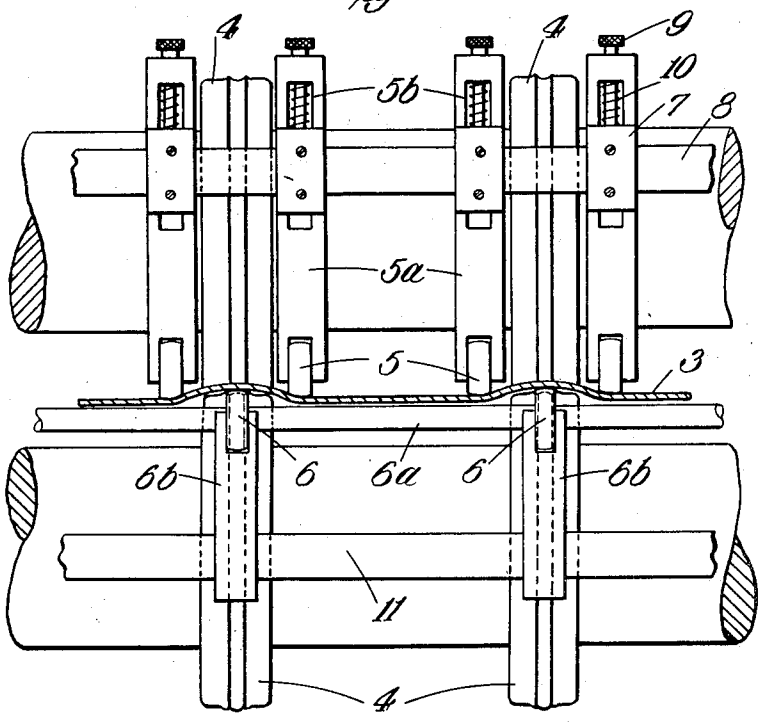
FIG. 3.



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UNITED STATES PATENT OFFICE

1,941,484

APPARATUS FOR BENDING OR CREASING CARDBOARD, FIBER BOARD, OR THE LIKE

John Irving Nasmith, Eltham, London, England, assignor to Vickers-Armstrongs Limited, Westminster, England, a British company

Application October 3, 1932, Serial No. 635,903, and in Great Britain January 30, 1932

14 Claims. (Cl. 93—58)

This invention relates to apparatus for performing bending, creasing, scoring or similar operations on cardboard, fiberboard or the like of the type in which the bends or creases are formed by the action of rotary tools, this type of apparatus being employed where the whole length of the board cannot be operated upon at the same time.

It is found that during the bending or creasing operations cracks occur in the board due to the fact that many kinds of cardboard, fiberboard or the like are so constituted as not to allow of any local expansion or contraction of the fibers in the working area under the influence of the tools, this being particularly noticeable when the materials are subjected to the action of the tools across the "grain" which is produced in the board making machine. Moreover, by whatever means the creasing or bending operation is performed a total contraction of the sheet from side to side must always take place if the material will not expand sufficiently during operation although in some cases the contraction can be reduced to a minimum by the employment of appropriate means. Consequently, not more than two creases or bends can be made in the material during one passage of the board through the machine due to the fact that for each crease or bend an unrestrained or free edge must be available from which the surplus material required for the crease or bend can be obtained. In many cases four or more creases or bends are required in each board as for instance where the latter are employed in the manufacture of boxes or containers with the result that two or more operations are required thereby considerably reducing the output of the bending or creasing apparatus.

The chief object of the present invention is to avoid this disadvantage so as to enable sheets of cardboard, fiberboard or the like to be bent or creased in more than two regions simultaneously.

According to the invention the sheet of cardboard, fiberboard or the like prior to its passage through the creasing or bending tools is reduced in its effective width, for example by buckling or curving the board, in such manner as to provide between each pair of adjacent creasing or bending tools surplus material from which the additional material required for the creases or bends can be obtained.

The boards presented to the creasing or bending tools are preferably buckled or curved so that the cross section of the board as it enters between these tools is of undulating, corrugated or similar form, the number of undulations, corrugations or curved portions and the extent or depth thereof being dependent upon the number of creases or bends to be made in the board, the class and weight of the material of the boards and the particular form of creasing or bending apparatus employed. It will be apparent that inasmuch as there is between the adjacent creasing or bending tools a curved portion of the board the extra or additional material required for the crease or bend can be drawn or obtained from these curved portions. This results in the creasing or bending operation being performed without rupturing or impairing the fibers of the board in the vicinity of the crease or bend.

In order that the said invention may be clearly understood and readily carried into effect the same will now be more fully described with reference to the accompanying drawings, in which:—

Figure 1 illustrates diagrammatically in front elevation the means employed according to the invention for buckling or curving the sheet of cardboard or the like;

Figure 2 is an end elevation of the means shown in Figure 1 juxtaposed with relation to the bending or creasing tools.

Figure 3 is a view similar to Figure 1 illustrating a modified form of apparatus.

As shown in Figure 1 of the drawings a sheet of cardboard or the like 3 is reduced in its effective width by buckling or curving the board so that it is of undulating or corrugated form in cross section this being effected before passing the sheet to the bending or creasing tools 4. The bending or creasing tools 4 comprise a series of superimposed complementary rollers or the like and the superimposed pairs of rollers are arranged side by side, the number of rollers employed depending upon the number of creases or bends to be made in the board. By buckling or curving the board 3 as shown a surplus of material is provided between each pair of adjacent creasing or bending tools from which the additional material required for the crease or bend can be obtained. The number of undulations or curved portions in the board and the extent and depth thereof are dependent upon the number of creases of bends to be made in the board and the particular form of creasing or bending apparatus employed. As shown in Figure 1, the means employed for imparting the undulating formation to the board comprise four upper rolls 5 carried in supports or bearings 5^a and three lower rolls 6, mounted on a shaft 6^a the lower rolls as shown being arranged in vertical planes inter-

mediate the planes containing the upper rolls 5 and being so disposed in relation thereto that as the board is fed between the said rolls 5 and 6 the latter impart to the board a contour of undulating form. In order to permit the form of the undulations or corrugations or curvature of the board to be varied the upper rolls 5^a may be provided with any suitable means for adjusting them both horizontally and vertically.

In Figures 1 and 2 of the drawings a suitable arrangement is shown for permitting the rolls to be varied. The supports 5^a are carried by bearing blocks 7 mounted upon a transverse bar 8. The supports 5^a are provided with slots 5^b which embrace the bearing blocks 7 and are capable of being moved vertically relatively to the blocks 7 by means of screws 9 threaded into the blocks 7 as shown in Figure 2, the supports 5^a being normally urged upwardly under the influence of compression springs 10. The blocks 7 are slidably carried on the transverse support 8 and may be secured in the adjusted positions on the said transverse bar 8 by any suitable means. The lower rolls 6 may also be provided with means so as to enable them to be adjusted in a horizontal direction so that the curvature imparted to the board may be varied depending upon the constitution of the board aforesaid and upon the distance apart of the adjacent creasing or bending tools.

As shown in Figures 1 and 2 the shaft 6^a supporting the rolls 6 is rotatably carried by supports 6^b which can be adjusted horizontally relatively to a transverse supporting member 11.

Figure 3 of the drawings shows a slightly modified arrangement of apparatus for imparting the undulating or corrugated form to the boards and in this construction it will be observed that each lower roll 6 co-operates with two upper rolls 5 to produce the curved portions, this arrangement being advantageous when the creases or bends to be imparted to the boards are more widely spaced apart. The resultant undulating or corrugated form of the board 3 when passed through the apparatus shown in Figure 3 is slightly varied and instead of the portions of the board between the adjacent bending or creasing tools 4 being of the arcuate form shown in Figure 1, it will be observed that the greater portion is of rectilinear form. It will be appreciated that inasmuch as there is between each pair of adjacent superimposed creasing or bending tools a curved portion of the board, the extra or additional material required for the crease or bend can be drawn or obtained from these curved portions, and as the board passes between the bending or creasing tools it is creased or bent so that the surplus material between the adjacent tools will be utilized in the formation of the crease or bend.

It is to be understood that the term "multi-curvilinear" employed in the sub-joined claims is intended to cover buckling the boards, or imparting to the said boards a contour of undulating, corrugated or similar form.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In combination with or for use with apparatus provided with a plurality of sets of creasing or bending tools for forming more than two creases or bends simultaneously in cardboard, fiberboard or the like, means for imparting to the boards a multi-curvilinear form without compressing the boards and before they are fed to the said creasing or bending tools.

2. In combination with or for use with apparatus provided with a plurality of sets of creasing or bending tools for forming more than two creases or bends simultaneously in cardboard, fiberboard or the like, means for imparting to the boards a multi-curvilinear form without compressing them and before they are fed to the said creasing or bending tools, and for providing curved portions in the boards for the creasing or bending tools to act upon.

3. In combination with or for use with apparatus provided with a plurality of sets of creasing or bending tools for forming more than two creases or bends simultaneously in cardboard, fiberboard or the like, means disposed in front of each set of bending or creasing tools to form, for each set of creasing or bending tools, a curved portion in the board immediately in the vicinity of the said tools, the said means being adapted to impart the curved portions without compressing the board, the said curved portions extending in the direction in which the board is fed so as to impart to the board a multi-curvilinear form prior to its passage past the said tools.

4. In combination with or for use with apparatus provided with a plurality of sets of creasing or bending tools for forming more than two creases or bends simultaneously in cardboard, fiberboard or the like, a plurality of rolls disposed in front of each set of bending or creasing tools for imparting to the boards a multi-curvilinear form without compressing them and before they are fed to the creasing or bending tools and in a direction transverse to the direction in which the boards are fed to the said bending or creasing tools.

5. Apparatus as in claim 3, and having a plurality of rolls disposed in front of each set of bending or creasing tools.

6. In combination with or for use with apparatus provided with a plurality of sets of creasing or bending tools for forming more than two creases or bends simultaneously in cardboard, fiberboard or the like, a plurality of upper rolls and a plurality of lower rolls for feeding the boards between before they are fed to the bending or creasing tools, each lower roll being disposed between a pair of upper rolls so as to impart to the boards before they pass to the said bending or creasing tools a multi-curvilinear form without compressing the boards.

7. Apparatus as in claim 3, and having a plurality of upper rolls and a plurality of lower rolls for feeding the boards between, each of the lower rolls being disposed between a pair of upper rolls so as to impart to the boards before they are fed to the said bending or creasing tools a multi-curvilinear form transversely to the direction in which the boards are fed.

8. In combination with or for use with apparatus provided with a plurality of sets of creasing or bending tools for forming more than two creases or bends simultaneously in cardboard, fiberboard or the like, a set of rolls operationally connected with each set of bending or creasing tools for imparting to the boards before they are fed to the said tools a multi-curvilinear form and without compressing the boards, each set of rolls comprising a pair of rolls disposed one on each side of one tool of each set and another roll for the other tool of the set, the last mentioned roll lying in a plane between the plane containing the first mentioned roll and projecting above the horizontal plane containing the lower edges of the said pair of rolls so as to provide a curved portion in

the board between the pair of rolls for the said creasing or bending tools to act upon.

9. Apparatus as in claim 6, and having means for adjusting the upper rolls both horizontally and vertically.

10. Apparatus as in claim 8, and having means for adjusting the pairs of rolls both horizontally and vertically.

11. Apparatus as in claim 6, and having means for adjusting the lower rolls horizontally.

12. Apparatus as in claim 8, and having means for adjusting the single rolls horizontally.

13. Appratus as in claim 6, and having means for adjusting the upper rolls horizontally and vertically, and for adjusting the lower rolls horizontally.

14. Apparatus as in claim 8, and having means for adjusting the pairs of rolls horizontally and vertically, and for adjusting the single rolls horizontally.

JOHN IRVING NASMITH.