Feb. 17, 1953 A. B. STEVENSON 2,628,656

MANUFACTURE OF CREPED PAPER

Filed July 29, 1950 3 Sheets-Sheet 1

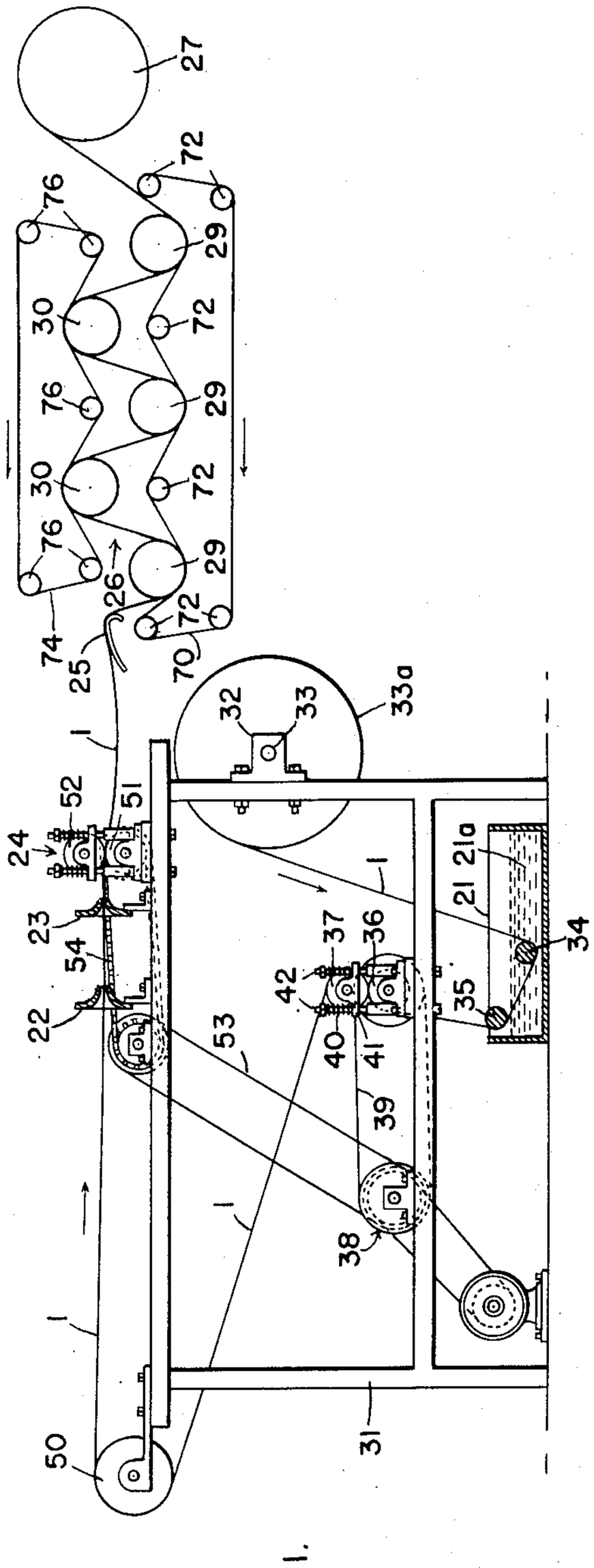

FIG. 1.

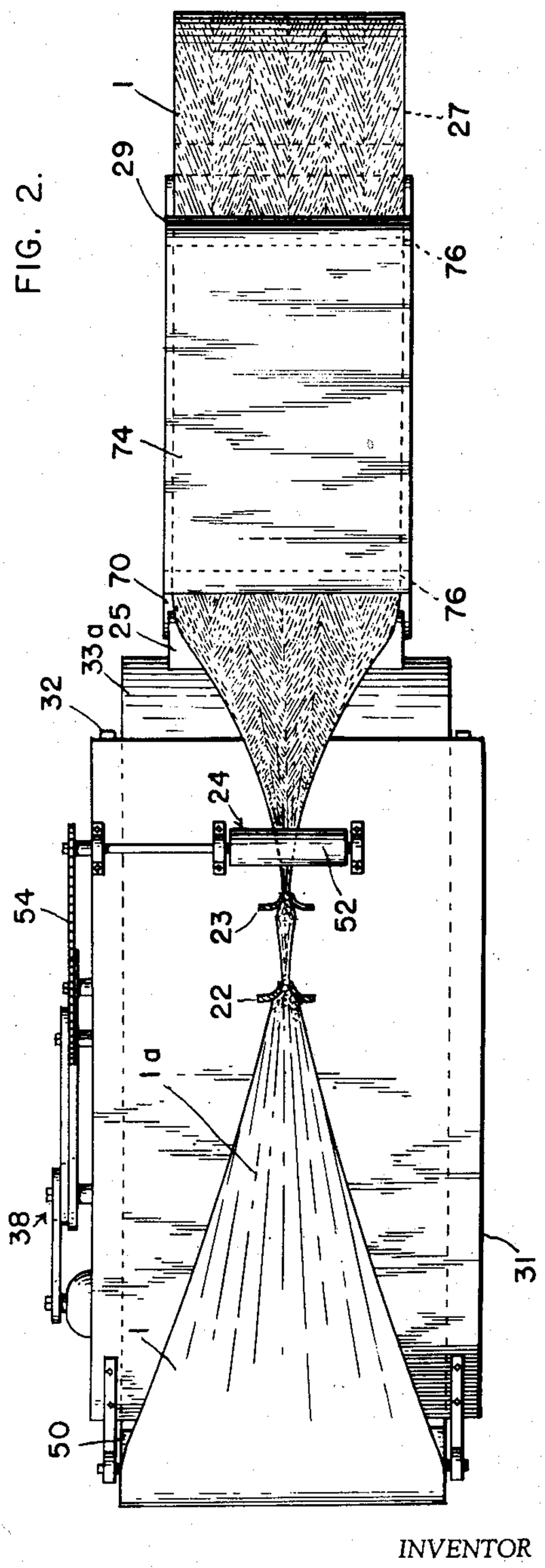

FIG. 2.

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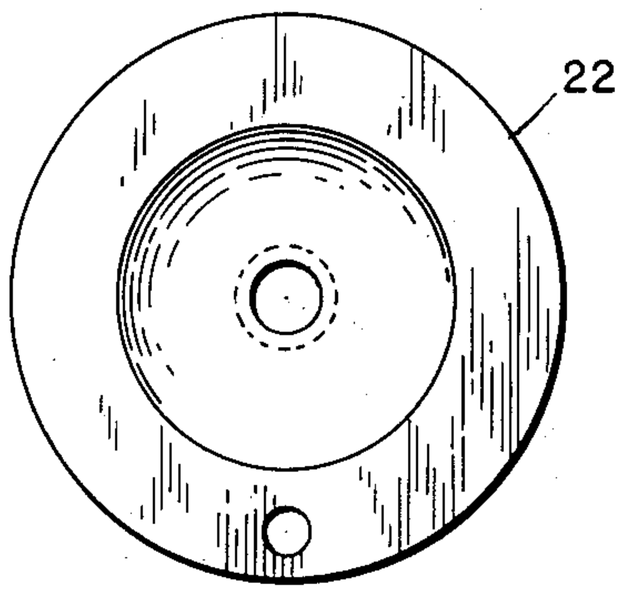

FIG. 4.

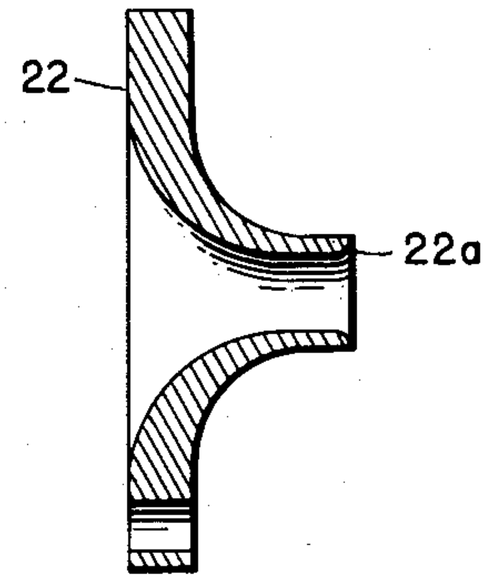

FIG. 3.

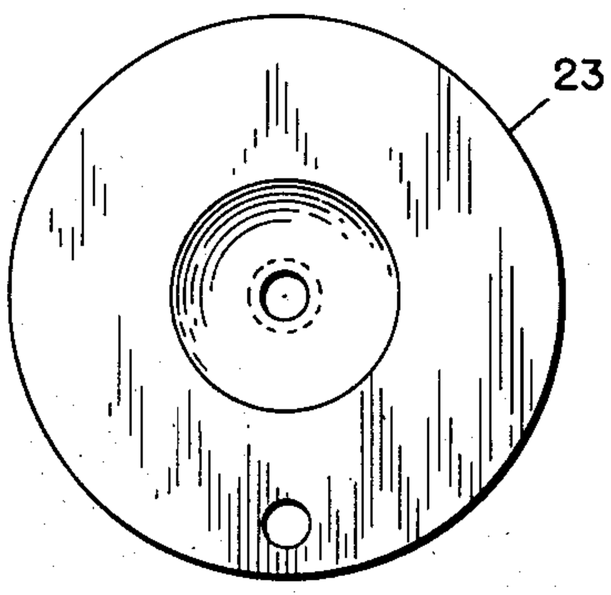

FIG. 6.

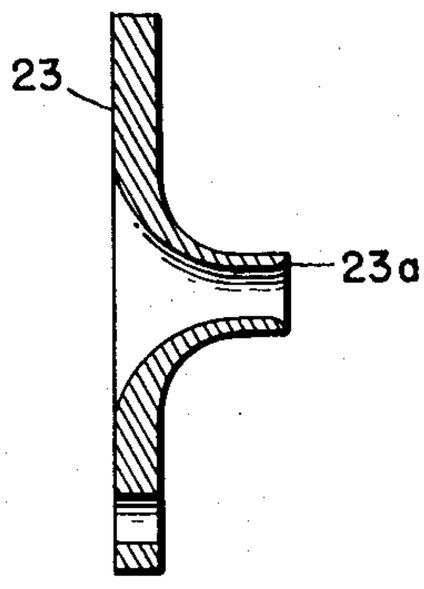

FIG. 5.

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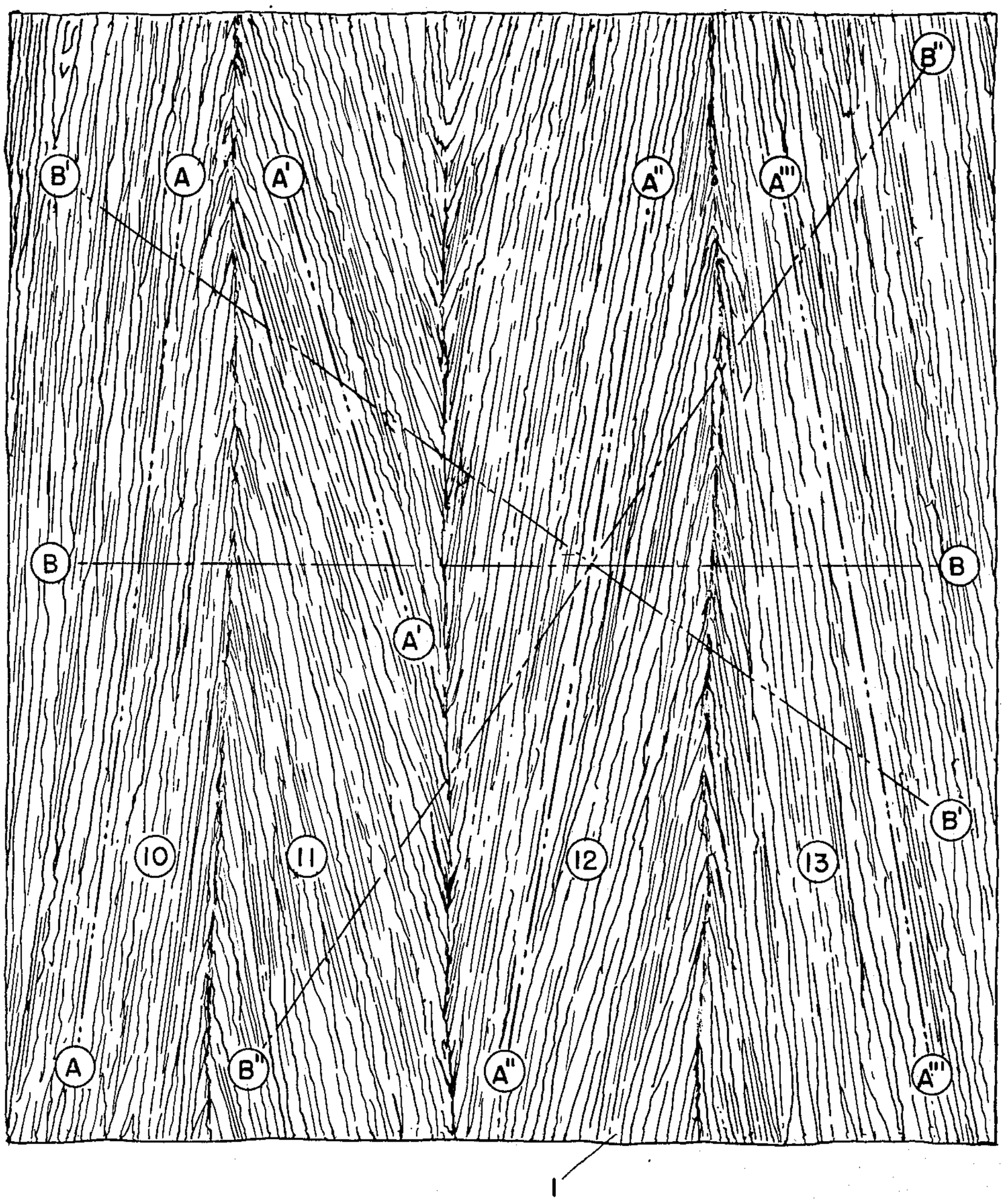

FIG. 7.

FIG. 8.

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2,628,656

MANUFACTURE OF CREPED PAPER

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Application July 29, 1950, Serial No. 176,679

2 Claims. (Cl. 154—30)

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This invention relates to the creping of webs of paper and the like and has for its objectives to provide a new method of creping, new apparatus therefor, and also a creped product having novel characteristics.

In the longitudinal creping of paper to impart transverse stretchability, difficulty is encountered in the use of conventional equipment on light-weight papers, due in part to their inadequate strength when wetted. In accordance with the preferred practice of the present invention, this difficulty is obviated by drawing the paper through one or more apertured dies having funnel- or bell-shaped entrances which ease the passage of the paper through the die. Preferably the successive dies have throats of successively diminishing sizes to contract the paper gradually from a wide flat sheet to a compacted, rope-like form having a cross-sectional diameter which is a small fraction of the original width of the flat sheet. The paper is then squeezed between rolls after which it is fanned out to its creped dimension widthwise and finally dried. In practice it has been found that transverse stretchability of the order of several hundred per cent, if desired, may be imparted to comparatively light-weight paper.

The paper produced by the method and apparatus of the present invention is believed novel and superior in its creping configurations to paper creped according to conventional practices, in that it has a measure of stretchability in virtually all directions.

Paper made in accordance with the present invention is useful particularly in the manufacture of adhesive laminated papers which may be employed for wrapping and packaging, or for box stay tapes such as are described in the U. S. Newkirk Patent No. 2,089,405 and the Smith Patent No. 2,026,194. The virtually universal stretchability permits the paper thus reenforced to be tensioned in many directions without breaking the paper fibers.

In the drawings:

Fig. 1 is a side elevation, partially diagrammatic, showing the preferred embodiment of the creping machine.

Fig. 2 is a plan view thereof.

Fig. 3 is a vertical section through the first trumpet.

Fig. 4 is a front elevation of the first trumpet.

Fig. 5 is a vertical section through the second trumpet.

Fig. 6 is a front elevation thereof.

Fig. 7 is a plan view of a sheet of creped paper, showing the sections with different creasing, and Fig. 8 is an edge view of the paper.

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The machine of Figs. 1 and 2 includes a frame **31** having supports **32** for an arbor **33** carrying a roll of paper **33***a* to be creped. The paper is unrolled and drawn under rollers **34**, **35**, roller **34** being within tank **21** and immersed in water **21***a* preferably containing a small amount of a wetting agent. Roller **35** is just above the water level, as shown. The paper is then drawn between the squeeze rolls **36**, **37**, adjustable as shown, to remove excess water. Roll **36** is power driven by the vari-speed drive unit **38** to which it is coupled by belt **39**, and roll **37** is pressed against roll **36** by springs **40** which urge the bearing bracket **41** downwardly on the bolts **42**.

After the paper passes between the rolls **36**, **37**, and over roll **37**, it passes to approach roll **50**, also rotatably mounted on the stand **31**. As the paper is brought up and over roll **50**, it is properly aligned for horizontal advance over the frame toward dies **22**, **23**, being drawn in that direction by unit **24** comprising power driven squeeze rolls **51**, **52**. The bottom roll **51** is coupled with the vari-speed unit **38**, by belt **53** and chain **54**. Roll **52** is adjustably pressed downwardly against roll **51** by springs in the same manner as roll **37** is pressed against roll **36**.

The paper **1** is drawn through die **22**, thence through the second die **23** with a slightly smaller orifice. The use of successive orifices of diminishing size is desirable to facilitate contraction of the web to rope-like form of a diameter which is only a small fraction of the flat width of the paper.

The die **22** should be located a sufficient distance from roll **50** to prevent tearing of the paper by converging it too sharply. The minimum distance between roll **50** and die **22** will depend upon such factors as the width of the paper, its type, weight, water content and the size and shape of the die **22** through which the paper is first drawn. The second die **23** should be disposed far enough from die **22** to permit any air, which may have become entrapped during the converging of the paper through die **22**, to leak out and thus avoid bursting of the paper by subsequent compression of entrapped air.

The dies may be of the shape shown in Figs. 5 and 6, although any funnel shape which will ease the paper into the orifice without tearing the paper or rupturing it, would serve. For a 12'' width 30 lb. kraft, for example, a 1½'' trumpet entrance diameter and $\frac{5}{16}$'' orifice works well; the second die may have a 1'' entrance diameter, and

$\frac{3}{16}$'' orifice. The exits preferably should be slightly beveled, as shown at **22***a*, **23***a*, to assure against rupturing of the paper, although such beveling is not essential.

The squeeze rolls **51**, **52**, in addition to providing the pull by which the paper **1** is drawn through the dies **22**, **23**, affect the final crepe pattern, depending upon their distance from the exit of the second die **23**. A finer creping is obtained as the distance is decreased. In the example given, ½'' to 2'' is a fair range.

After the paper leaves the squeeze rolls **51**, **52**, it passes over spreader **25** which is convexed to aid in spreading the paper to its full creped width without tensioning it laterally to remove creasing. From the spreader, the paper passes around lower drying drums **29** and upper drums **30**, alternating between the two sets of drums as shown. The blanket **70** trained around guide rolls **72** serves to press the paper into peripheral contact with the lower set of drums, and a similar blanket **74** trained around rolls **76** presses the paper against the upper series of drums. The drums are heated, as is conventional in the paper industry.

After being dried, the paper is wound up at **27**.

Figs. 7 and 8 illustrate diagrammatically paper that has been creped by the method and machine described above. The converging folds *1a* later contracted and compressed in passing through the dies and between the squeeze rolls **24** result in an arrangement of paper creases to impart a sort of herring-bone appearance with the creases extending at various inclinations lengthwise of the paper, but in the aggregate extending preponderantly lengthwise or in the machine direction of the paper so that the paper has a high degree of transverse stretchability when tensioned transversely as on the line B—B, Fig. 7. The crepings are arranged in sections, of which four are shown, designated **10**, **11**, **12** and **13**. The crease lines, in each section run preponderantly in the same direction at an inclination to the length of the paper and with the crease lines in one section disposed at an acute angle relative to the crease lines in the next adjacent section. The average directions of the crepe lines in the sections is indicated by the dash-dot lines A—A, A'—A', A''—A'', A'''—A'''. Because of this relative inclination of the crepe lines, the paper has stretchability in many directions other than purely transverse.

Thus, stretchability is present as the paper is tensioned along such diverse directions as B'—B' and B''—B''. Indeed there is some measure of stretchability even when tensioned along a line nearly parallel with the longitudinal axis of the web.

I claim:

1. Apparatus for creping a web of material to impart transverse stretchability, comprising a plurality of apertured dies through which the paper is drawn in succession, said dies having openings which are substantially circular in cross section and are substantially smaller than the flat width of the web and one of said dies having one opening which is smaller than the opening in another of said dies which precedes it, and means for drawing the web successively through the dies to compact the web laterally.

2. The method of making creped sheet material which consists in wetting a web of the material, forming the wetted web into a plurality of longitudinal folds extending continuously in converging directions from an area of the web occupying substantially its full unfolded width to a narrowly contracted area thereof, while the web is unsupported, thereafter further compacting the web laterally and subsequently pressing the compacted web to impose crepings in the web, and thereafter spreading the web to a width substantially greater than said contracted width and substantially less than said full unfolded width to substantially remove said converging folds while avoiding such tensioning of the web laterally as would remove the crepings, whereby the crepings are formed at various inclinations lengthwise of the web to impart stretchability to the web in various directions.

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