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MEASURING AND COMPARATOR DEVICE

Filed Sept. 1, 1966

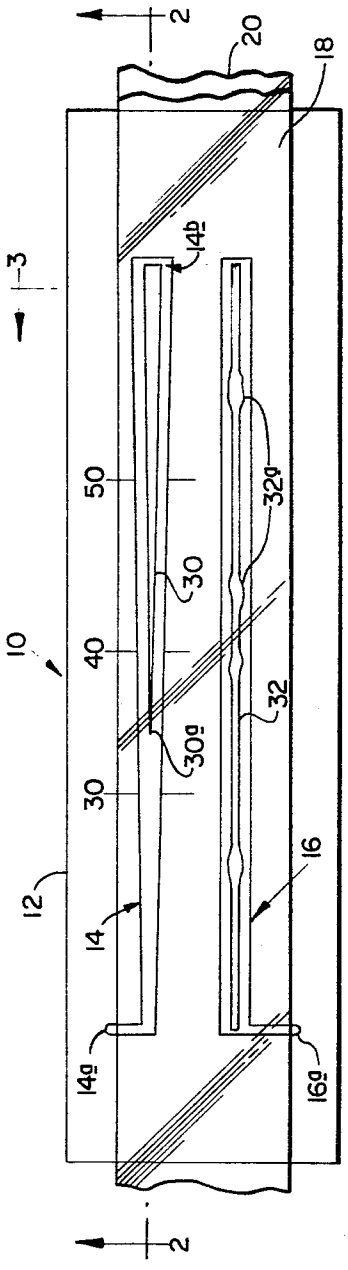


FIG. 1

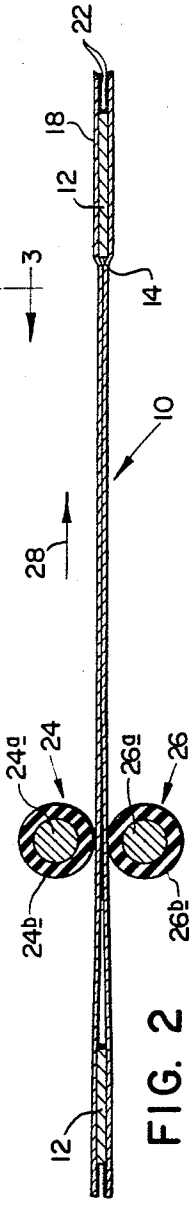


FIG. 2

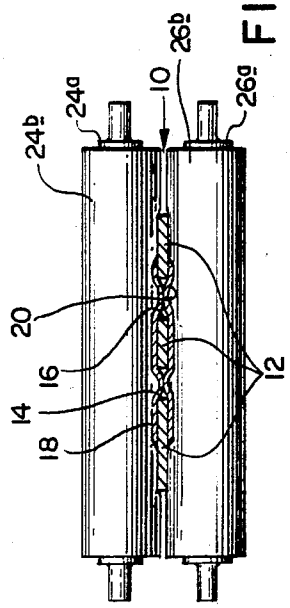


FIG. 3

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MEASURING AND COMPARATOR DEVICE

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This invention relates to a novel testing or comparator device for determining the compressive characteristics of adjustably mounted pressure rolls and for enabling the correction of compressive settings of the rolls with respect to given materials introduced therebetween.

Where rotatable pressure rolls having resilient surfaces are utilized for applying a compressive and/or propulsive force for some given purpose to sheet materials passed therebetween, it is generally necessary to insure that the dynamic pressure exerted by the aforesaid roll surfaces is correct. It is also of importance to make certain that the rolls are capable of providing a consistent compressive force throughout their surfaces, that is, that no flaws in the surfacing sheaths of the rolls or other causes of uneven compressive function shall exist.

Instances of usage in which the aforementioned considerations are of significance include laminating procedures wherein two or more sheet materials having adjacent surfaces adapted to be bonded together or having a bonding substance introduced therebetween are subjected to compression between one or more pairs of rotatable pressure rolls, each roll, for example having a sheath or casing of a natural or synthetic resilient or elastic material. The above-mentioned factors are also of importance in the printing art as, for example, with respect to rolls employed in offset printing processes.

A particular contemplated type of pressure roll is that which may be employed in the photographic field for some especially exacting purpose requiring the bringing together and compression of delicate film surfaces. One such purpose involves the processing of photosensitive film materials wherein, after a photographic exposure, a processing liquid is released and spread between the layers of a composite film structure to effect a diffusion transfer of image-forming substances and the production of a photographic print on one of the layers. To obtain a correct spreading and thickness of the processing liquid and the production of a perfect print, a measurement of correct dynamic pressure and a determination of the presence or absence of imperfections in the roll surfacing material are of extreme importance. While pressure rolls having a non-yielding surface, e.g., metallic pressure rolls, are predominantly employed in the foregoing diffusion-transfer process, at least in the instance where they are incorporated in hand-held cameras of the type sold by Polaroid Corporation of Cambridge, Massachusetts, U.S.A., in other examples such as that wherein the pressure rolls are components of an X-ray film-processing device, also sold by Polaroid Corporation, they may, appropriately, be resiliently surfaced, as described hereinbefore, and may be employed both for compressive and propulsive functions associated with the release and spreading of a liquid for a processing purpose, as well as for the removal of a processed film assembly from an enclosing chamber or the like.

In view of the foregoing considerations, objects of the invention are to provide a device which may be termed a "comparator" for readily obtaining an indication or reading of the dynamic-pressure characteristics of a pair of rotatable, cooperating pressure rolls and for enabling an adjustment of said characteristics according to said indication; to provide a device for revealing possible imperfections within a resilient functional surfacing material or sheath of the pressure rolls; to provide a device of the character described which gives both a dynamic-pressure reading and a reading of any compression fluctuations which may occur at different surface portions of the pressure rolls due, for example, to material imperfections or faulty rotational characteristics; to provide a device of the category stated wherein a first dynamic pressure reading is monitored for accuracy by a second compression-characteristic reading; to provide a device of the character described having a scale calibrated in one of a choice of possible indicia comprising roll durometer values; metering speed of materials compressed; resiliency of materials compressed, etc. and to provide a device or gauge of the type characterized which is of simple construction, inexpensive, highly accurate, and adapted to use in the field without requiring any dismantling of apparatus to be adjusted, thus permitting measurements to be taken with utmost ease and rapidity.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the apparatus possessing the construction, combination of elements and arrangement of parts which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing wherein:

FIGURE 1 is a diagrammatic plan view of the testing device or gauge of the present invention;

FIG. 2 is a diagrammatic, sectional elevation view of the device, taken along the line 2—2 of FIGURE 1; and

FIG. 3 is a diagrammatic end view, partly in section, taken along the line 3—3 of FIGURE 1.

Referring now to FIGURE 1, the device **10** of the invention is shown from above. It includes a central element or support **12**, namely, a relatively thin elongated strip of a metal, a plastic or the like having a tapered slot **14** and a rectangular slot **16** formed therein. The slots **14** and **16** extend in side-by-side relation longitudinally of the element **12**, their axes being parallel. Two strips or tapes of similar dimensions, namely, an upper tape **18** and a lower or underlying tape **20**, composed of a flexible material, preferably light-transmitting, each having an adhesive **22** coated on an inner or facing surface, are attached by means of the adhesive surfaces to opposite sides of the central element **12**. The tapes **18** and **20** are aligned with one another and are of a width and length sufficient to cover the slots **14** and **16** and adhere firmly to the element **12** in areas surrounding the slots. The slots **14** and **16** include transversely extending air-venting portions **14***a* and **16***a*, respectively, which protrude laterally slightly beyond the edges of the superimposed tapes **18** and **20**. The tapered slot **14** is marked off along its length by indicia representative of various hardness values associated with a durometer. The assembly of FIGURE 1 is adapted to be passed between a pair of resiliently surfaced, rotatable pressure rolls for the purpose of determining or measuring the dynamic pressure exerted thereby and the presence, of or freedom from, defects or blemishes on or within the roll surfaces.

FIG. 2, which is a sectional view taken along the line 2—2 of FIGURE 1, longitudinally bisects the tapered slot **14** and illustrates the operation of the gauge with respect to a pair of rotatable pressure rolls **24** and **26** having, for example, steel cores **24***a* and **26***a*, and resilient sheaths **24***b* and **26***b*, respectively. It is to be assumed that the rolls **24** and **26** are mounted for rotation in bearing means which are positionable to permit relatively convergent or divergent translational movement of the rolls toward or away from one another. The convergent movement may be in the form of a biasing force instigated by spring means or the like, not shown. The rolls may also include

either manual or power means such as a hand-crank or a motor, not shown, for providing their rotation, in which case they serve both a compressive and a propulsive function. Alternatively, rotation of the rolls may be effected by drawing upon the device **10**, frictional contact of the tapes **18** and **20** with the roll surfaces being sufficient to effect their turning. The sheaths **24***b* and **26***b* may, appropriately, both be composed of a similar resilient material, e.g., a suitable rubber or a synthetic rubber such as "neoprene," sold by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., U.S.A.

Further referring to FIGURE 1, the index marks **30**, **40** and **50** relate to certain hardness values or indicia of a durometer. The range of the indicia illustrated has been chosen with respect to commercially available pressure rolls having a durometer value lying within this range. For pressure rolls having other hardness or resilience characteristics, a different range of values would, of course, be employed. It is to be assumed that the testing device **10** is undergoing relative movement with respect to the pressure rolls **24** and **26** in the direction indicated by the arrow **28** as, for example, by powered rotation of the rolls. It will thus be understood that a dynamic compressive force has been applied by the rolls such that the device **10** has undergone compression, extending from the right-hand extremity thereof to the portion which is shown positioned between the pressure rolls, and that compression is continuing in a direction toward the left-hand extremity. While a given direction of compression is illustrated, it is to be understood that this direction may, alternatively, be from left-to-right and that the latter direction may even be preferred. If this is the case, venting means similar to **14***a* and **16***a* would be included at the right-hand extremities of the slots **14** and **16**.

The durometer data associated with pressure rolls are conventionally supplied therewith by the manufacturer. Assuming the surface material of the pressure rolls employed to lie within the durometer range of values illustrated, a given overall thickness of the device **10**, and a given depth of the slot **14**, then the width of the slot **14** at the portion **14***b* first introduced between the pressure rolls, is so chosen that the pressure roll surfaces **24***b* and **26***b* readily deform and are pressed into the slot depression from opposite sides to a functional depth. This causes the resilient tapes **18** and **20**, against which the pressure roll surfaces bear, to come into contact with one another and, by reason of the adhesive coating on their facing surfaces, to adhere to one another. The deformation characteristics of the roll surfaces, when taken with the given depth and given narrowing dimensions or taper angle of the slot **14**, are such as to provide a tapering adhesion pattern **30** of the pressed-together tapes, terminating at a given point **30***a* longitudinally of the slot. This point is reached at a certain width of the tapered slot **14** which is so narrow that, just beyond it to the left, the roll surfaces **24***b* and **26***b* cannot deform to that degree which is necessary to permit them to enter the slot and press the tapes **18** and **20** together. Continued relative movement of the device **10** and the pressure rolls in the direction indicated by arrow **28** will, of course, provide no extension to the left of the pattern **30**. The venting portion **14***a* permits an expulsion of air from the slot which might otherwise build up to an unwanted pressure tending to operate against contact of the tape surfaces and leading to an incorrect establishment of the point **30***a*.

If, following the above-described procedures the point **30***a* of the test or comparator pattern is established opposite the index mark representing the known durometer value of the pressure rolls employed, it is to be assumed that the dynamic pressure exerted by the rolls will be correct with respect to the sheet material which is to undergo compression. If the point is at some other index mark, the pressure rolls must be adjusted with respect to their relative contiguity or spacing or their convergent bias to provide a correction of compressive force. After each such adjustment of the pressure rolls, the device **10** is passed between the rolls. When the adjustment is correct, the point **30***a* of the test pattern will lie opposite the known durometer index mark relating to the pressure rolls utilized. This position establishes a predeterminedly correct dynamic compressive force exerted by the pressure rolls with respect to a sheet material passed therebetween. The compressive operation is illustrated transversely of the device **10** in FIG. 3.

The slot **16** serves a dual purpose. It monitors the reading within the slot **14** to a certain extent by indicating in the test pattern **32**, again produced by a linear adhesion of the tapes **18** and **20** under compression, whether an evenness or unevenness of pressure exists lengthwise of the rolls along a line intersecting the point **30***a*. It also indicates by uneven pressure marks **32***a* any defects in the roll surfaces which may be sufficiently serious to warrant replacement of a defective roll. The venting portion **16***a* serves a purpose similar to that of the vent **14***a*, above described.

The lengths of the slots **14** and **16** should be at least equal to the circumference of a pressure roll to give an adequate representation of the roll surfaces in terms of the test patterns. If the slots are of greater length, repeat test patterns may, advantageously, be produced. Certain dimensions of the device **10**, satisfying the requirements of a workable testing device but to be taken merely by way of example, involve: a thickness of plate **12** of .020 inch; a slot length of 9 inches; a width of slot **14** at one end of $\frac{11}{32}$ inch and of $\frac{3}{16}$ inch at the other end; a width of slot **16** of $\frac{5}{16}$ inch; and a taper of slot **14** of 1°. The tapes **18** and **20** may, appropriately, both be a transparent Scotch tape, No. 600, sold by Minnesota Mining and Manufacturing Co., St. Paul, Minn., U.S.A. Alternatively one opaque and one clear tape, configurated metallic tapes or some other type thereof may be employed for forming the visible test pattern, any such material being considered as falling within the scope of the invention.

The scale shown in FIGURE 1 may be calibrated in terms of indicia other than those shown to enlarge the field of usage of the device **10**. Such alternative indicia are to be obtained from test runs involving pressure rolls of given characteristics and/or sheet materials of given structure. Thus, for example, the scale may represent various thicknesses of sheet materials to be compressed with values, starting at the right and proceeding to the left, of .020", .015", .010" and .005". Another possible scale may comprise pounds-force values, with respect to compression of a given sheet material, e.g., 8 lbs., 10 lbs., 12 lbs., and 14 lbs., similarly arranged. A still further scale can be calibrated in terms of speed of movement of a sheet material between the pressure rolls, for example, from right-to-left, in values of 90 ft., 75 ft., 60 ft., and 45 ft. per minute. Another type of scale can be calibrated, for instance, in values of resiliency of compressible sheet materials. In each instance, it will be understood that a reading is taken by passing the device between the pressure rolls, as previously described, observing the position of the test pattern point **30***a*, and adjusting the pressure roll compression to bring the point **30***a* to the desired or relevant index mark.

It is to be understood that the device **10** can be modified to an extent such that the plate **12** may include but one of the slots **14** and **16** and still retain one of the several functions attributed to the device as shown. Thus, for example, the slot **14**, alone, provides the measuring or comparator function enabling corrective adjustment of the pressure rolls and the slot **16** alone permits a reading of roll surfacing defects, only the monitoring function being lost. While the air-venting means **14***a* and **16***a* constitute a preferred embodiment, it will be apparent that other means for the purpose could be substituted therefor and are considered to lie within the scope of the invention. One such modification could be in the form of a perforation formed in tape **18**, for example, adjacent to an extremity of each of the slots **14** and **16**.

Since certain changes may be made in the above apparatus without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An element for use with a pair of resilient adhesive tapes for measuring and permitting adjustment of the dynamic compressive force exerted by a pair of pressure rolls having deformable surfaces, comprising an elongated, thin, generally rectangular, plate-like support component of a given thickness, an elongated slot of given length and width characteristics formed in said plate-like support element so as to extend longitudinally thereof throughout a distance which is at least equal to the circumference of one of said pressure rolls, and a scale comprising a plurality of index marks positioned along said elongated slots relating to the compression of a sheet material to be passed between said pressure rolls, said support component being adapted to have said tapes so affixed to each of its opposite surfaces, in generally aligned relation, as to cover both sides of said elongated slot, said element, when passed endwise between said pressure rolls, deriving therefrom a mutual progressive adhesion of said tapes within a given limited area of said elongated slot, thus forming a test pattern in said tape which is determined as to its length, width and configuration by the width and depth characteristics of said slot, by the surface characteristics of said pressure rolls, and by the dynamic compressive force exerted by said pressure rolls, said test pattern being readable in terms of the indicia of said scale and relating to said dynamic compressive force.

2. An element for use with a pair of resilient adhesive tapes for measuring and permitting adjustment of the dynamic compressive force exerted by a pair of pressure rolls having deformable surfaces, comprising an elongated, thin, generally rectangular, plate-like support component of a given thickness, an elongated slot of given length and width characteristics formed in said plate-like support element so as to extend longitudinally thereof throughout a distance which is at least equal to the circumference of one of said pressure rolls, a scale comprising a plurality of index marks positioned along said elongated slot relating to the compression of a sheet material to be passed between said pressure rolls, and a relatively short, transverse air-venting slot formed in said support component and leading laterally from said elongated slot at at least one end of the latter, said support component being adapted to have said tapes so affixed to each of its opposite surfaces, in generally aligned relation, as to cover both sides of said elongated slot and to partially cover said transverse slot, said element, when passed endwise between said pressure rolls, deriving therefrom a mutual progressive adhesion of said tapes within a given limited area of said elongated slot, thus forming a test pattern therewithin which is determined as to its length, width and configuration by the width and depth characteristics of said slot, by the surface characteristics of said pressure rolls, and by the dynamic compressive force exerted by said pressure rolls, said test pattern being readable in terms of the indicia of said scale and relating to said dynamic compressive force.

3. An element, as defined in claim 2, wherein said elongated slot is tapered to a given degree such that said deformable pressure-roll surfaces are capable of entering said slot to a functional depth at given widths of said slot when taken with a given dynamic compressive force exerted by said pressure rolls, but are incapable of entering said slot to said depth at other widths thereof and during other dynamic compressive forces exerted by said pressure rolls.

4. A comparator device for measuring the compressive characteristics of and permitting adjustment of the dynamic compressive force exerted by a pair of axially adjustable pressure rolls having deformable surfaces, said device comprising an elongated, thin, generally rectangular, plate-like support component of a given thickness, an elongated slot of given length and width characteristics formed in said plate-like support element so as to extend longitudinally thereof throughout a distance which is at least equal to the circumference of one of said pressure rolls, a scale comprising a plurality of index marks positioned along said elongated slot relating to the compression of a sheet material to be passed between said pressure rolls, a relatively short, transverse air-venting slot formed in said support component and leading laterally from said elongated slot at at least one end of the latter, and a pair of elongated resilient adhesive tape components so affixed in generally aligned relation to opposite surfaces of said support component as to completely cover both sides of said elongated slot and to partially cover said transverse slot, said device, when passed endwise between said pressure rolls, deriving therefrom a mutual progressive adhesion of said tape components within a given limited area of said elongated slot, thus forming a test pattern in said tape components which is determined as to its length, width and configuration by the width and depth characteristics of said slot, by the surface characteristics of said pressure rolls, and by the dynamic compressive force exerted by said pressure rolls, said test pattern being readable in terms of the indicia of said scale and relating to said dynamic compressive force.

5. A comparator device for measuring the compressive characteristics of and adjustment of the dynamic compressive force exerted by a pair of axially adjustable pressure rolls having deformable surfaces, said device comprising an elongated, thin, generally rectangular, plate-like support component of a given thickness, a first elongated slot of given length and width characteristics and tapered to a given degree formed in said plate-like support element so as to extend longitudinally thereof, a second elongated non-tapered slot of given length and width characteristics formed in said plate-like support so as to extend longitudinally thereof in side-by-side relation to said first slot, both said slots extending throughout a distance which is at least equal to the circumference of one of said pressure rolls, a scale comprising a plurality of index marks relating to the compression of a sheet material to be passed between said pressure rolls, said scale being positioned along said tapered elongated slot, a pair of relatively short, transverse air-venting slots formed in said support component and leading laterally from said elongated slots at at least one end of each of the latter, and a pair of elongated resilient adhesive tape components so affixed in generally aligned relation to opposite surfaces of said support component as to cover both sides of said elongated slots and to partially cover said transverse slots, said device when passed endwise between said pressure rolls deriving therefrom a mutual progressive adhesion of said tape components within a given limited area of said elongated slots, thus forming test patterns in said tape components which are determined as to configuration by the width and depth characteristics of said slots, by the surface characteristics of said pressure rolls, and by the dynamic compressive force exerted by said pressure rolls, said test pattern being readable in terms of the indicia of said scale and relating to said dynamic compressive force.

6. A device, as defined in claim 5, wherein at least one of said tape components is light transmitting.

7. A device, as defined in claim 5, wherein said scale relating to said tapered slot is calibrated in durometer indicia which includes a durometer value associated with the surfaces of said pressure rolls.

8. A device, as defined in claim 5, wherein said scale relating to said tapered slot is calibrated in terms of thicknesses of sheet materials to be passed between said pressure rolls.

9. A device, as defined in claim 5, wherein said scale relating to said tapered slot is calibrated in terms of pounds force exerted by said pressure rolls.

10. A device, as defined in claim 5, wherein said non-tapered slot exhibits, in terms of one of said test patterns, the presence of absence of imperfect compressive action of said pressure rolls.

References Cited

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