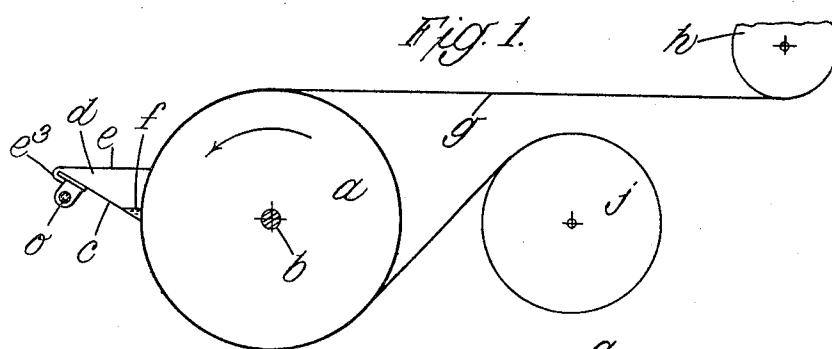
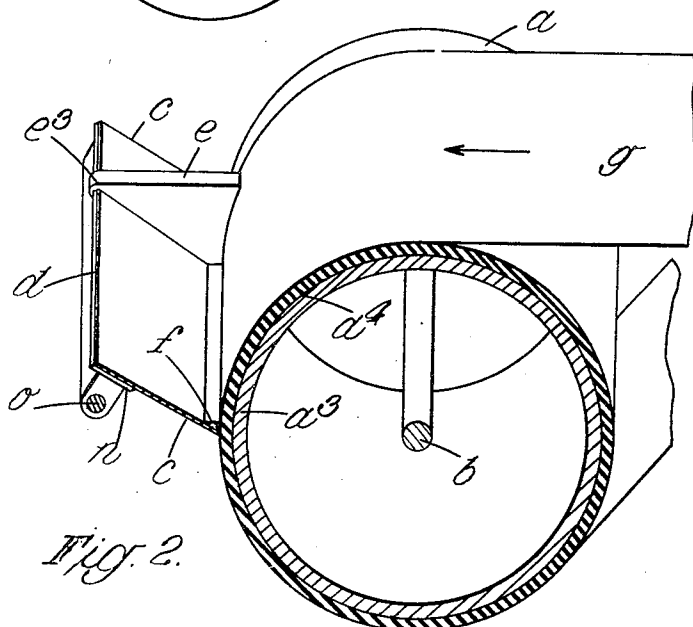
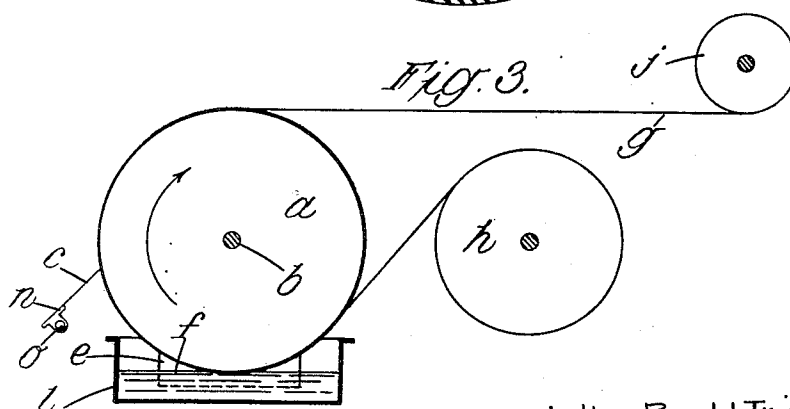


Jan. 30, 1945.

A. R. TRIST
MACHINE FOR THE COATING OF WEBS OF PAPER
AND LIKE ABSORBENT MATERIAL
Filed Sept. 17, 1941

2,368,176

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

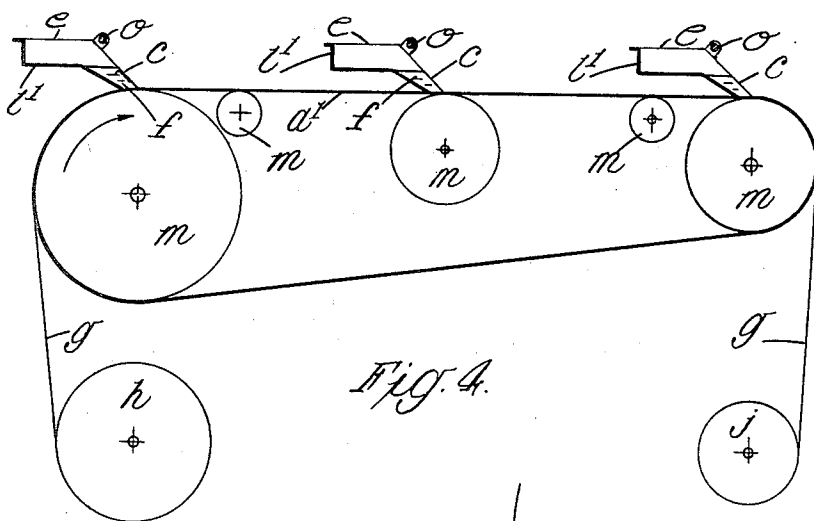


Fig. 4.

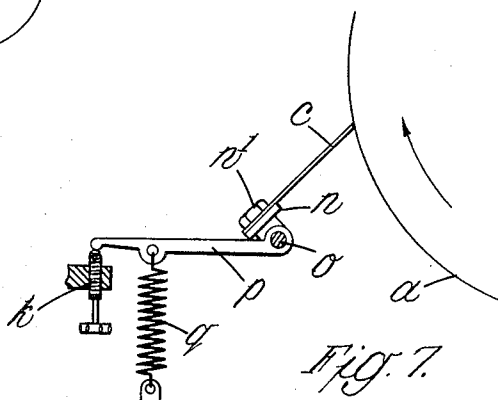


Fig. 7.

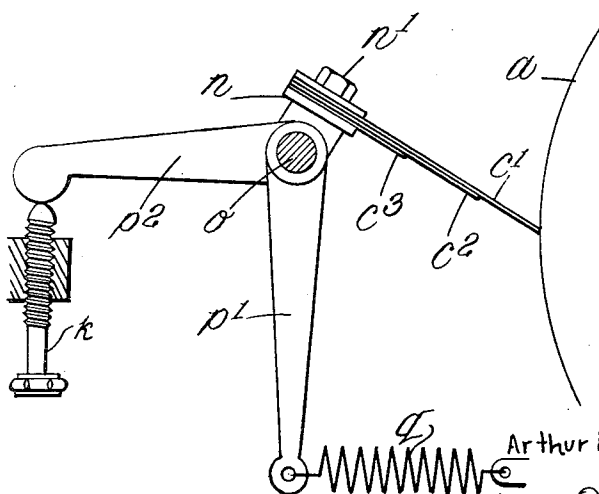


Fig. 8.

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3 Sheets-Sheet 3

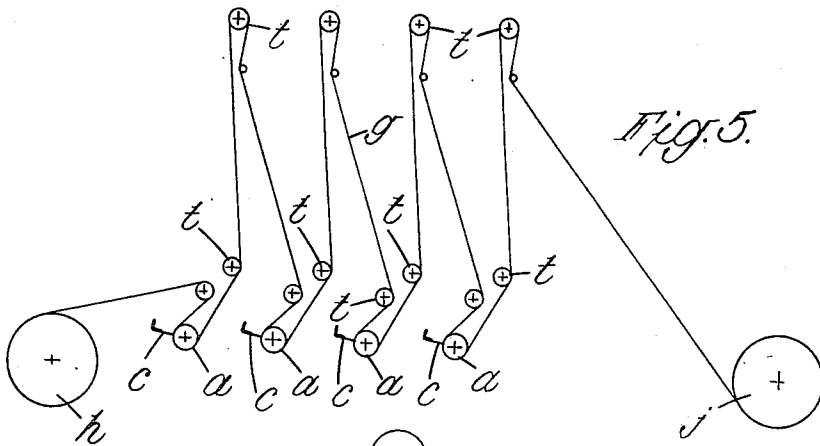


Fig. 5.

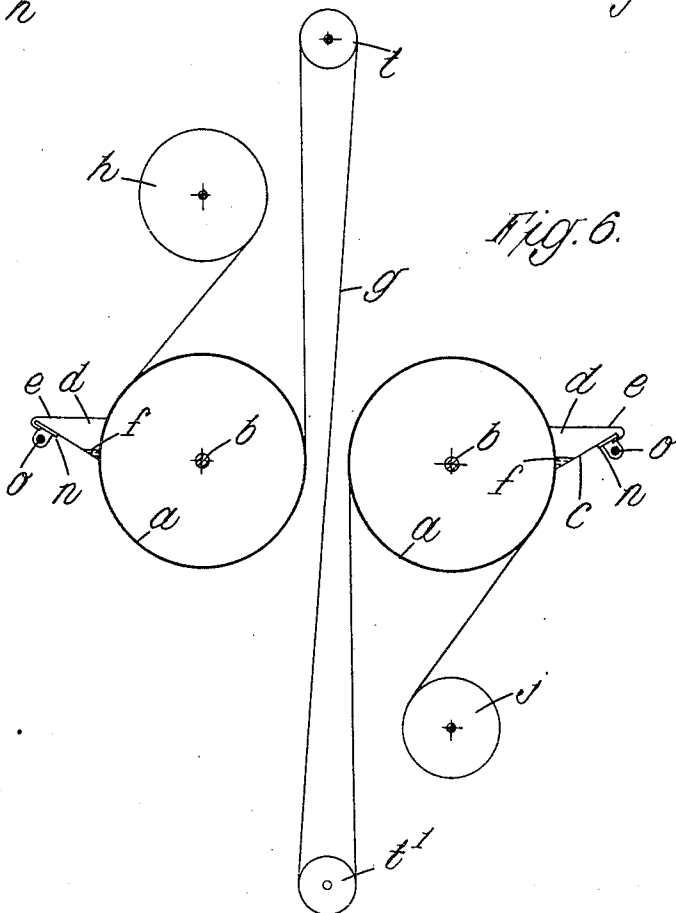


Fig. 6.

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UNITED STATES PATENT OFFICE

2,368,176

MACHINE FOR THE COATING OF WEBS OF
PAPER AND LIKE ABSORBENT MATERIAL

Arthur Ronald Trist, London, England

Application September 17, 1941, Serial No. 411,130
In Great Britain September 20, 1940

4 Claims. (Cl. 91-43)

This invention relates to improvements in machines for the coating of webs of paper and like absorbent material and has for its object to effect such coating continuously and evenly by a simple machine capable of operation at an economically high speed and which can be adjusted easily to control the width and thickness of the coating, bearing in mind the viscosity of the coating mixture.

The invention is particularly useful for the application to a web of paper of a mixture which will not water wet the paper, for example an oil phase resin bearing emulsion.

The invention consists in a machine for the coating of webs of paper and like absorbent material comprising a moving bed for supporting said web, means for applying coating mixture to said web without water wetting said web and stationary scraper means cooperating yieldingly with the coated surface of the web to spread the coating mixture and produce a thin and even coating.

The invention may be carried into effect in a variety of ways and by divers mechanical constructions, that is to say, the elastic bed may be in the form of a roller or a continuous belt and, if the latter, parts thereof may be inclined at different angles or the belt as a whole may be tilted; the emulsion can be supplied by gravity, by immersion, or by surface contact, and the elastic cooperation can be adjusted and controlled in different ways.

In the accompanying drawings:

Figure 1 shows diagrammatically one form of roller machine in which the emulsion is fed by gravity from a duct supplied by pressure feed;

Figure 2 is a perspective fragmentary section through a part of a machine of the kind shown in Figure 1;

Figure 3 shows diagrammatically a different form of roller machine in which the emulsion is applied by surface contact;

Figure 4 shows diagrammatically a form of belt machine for applying successive coatings, in which the emulsion is fed by gravity from ducts or fountains supplied by pressure feed;

Figure 5 shows diagrammatically an arrangement for applying successive coatings in which there is provision for considerable drying time between the coats;

Figure 6 shows diagrammatically an arrangement for applying coatings successively to both sides of a web;

Figure 7 is a fragmentary view showing as a detail one kind of scraper blade suitable for use

in Figure 3 with its mounting and adjusting means;

Figure 8 is a fragmentary view showing as a detail a different kind of scraper blade suitable for use in Figures 1 and 2 with its mounting and adjusting means.

This invention most conveniently makes use of an emulsion as the vehicle for the coating substance (pigment and binder for example) which emulsion comprises a continuous phase consisting of a hydrocarbon (such as a petroleum for example) a disperse phase consisting of water in a finely divided state, and the usual emulsifying and phase controlling agents producing appropriate protective colloids all compounded to produce a mixture of the required viscosity suitable for hydraulic feed to the fountains and ducts of the various arrangements described hereinafter.

Emulsions of this kind are not volatile in the ordinary sense of the word but when such an emulsion is applied to an absorbent material (such as paper for example) it deposits the pigment and other substances (if any) on the absorbent material without water wetting such material and thereby reducing its tensile strength and effects such deposition very rapidly so that surface treatment of the coating or of the web after coating has to be effected as quickly as possible.

As shown in Figures 1 and 2 the improved coating means consists of a roller *a* of material, the resilience of which has to be regarded as supplementary to the resilience of the web supported thereby so that when the web is thick the material may be comparatively inelastic, but with ordinary thin paper webs, the material selected is elastic (such as india rubber, for example), which is journaled at *b* and a stationary trailing scraper blade *c* angularly arranged relatively to the surface of the roller *a* so as to form a duct or fountain *d*, the width of which is determined by marginal restrictors, side walls or dykes (hereinafter called dykes) *e*, mounted on the blade *c* in an adjustable manner to form a trough of definite width for the coating emulsion *f*.

The dykes *e* may be mounted on a stationary part of the machine or on the stock carrying the scraper blade *c* instead of on the scraper blade itself as may be found to be convenient as a matter of construction or operation.

As shown in Figure 1 the web *g* of paper or the like passes from the stock roll *h* around the roller *b* to be rewound on the roll *j*, the web *g* in its passage forming a boundary surface of the duct or fountain *d*, so that the emulsion *f* therein

is applied to a defined part of the width of the web *g* for a defined period of time. The web *g* then passes between the surface of the roller *b* and the edge of the scraper blade *c* so that the surplus deposit is removed and that remaining as well as the surface of the web *g* is smoothed to produce a very even texture which may have the barest minimum of deposit thereon, the edge of the scraper blade *c* being smoothed to avoid any scratching or abrasion of the finished surface.

The coating operation is closely analogous to that of spreading butter on a slice of bread with a knife and to obtain the best results for a certain thickness of the butter spread, the angle of the knife, the torque exerted by the wrist, the resilience of the bread and the viscosity of the butter, all have to be coordinated, similarly in the present invention, the angle of the scraper blade *c*, the contact pressure, the resilience of the elastic roller *b* and the viscosity of the emulsion, all have to be adjusted to cooperate with the particular web being coated if a coating of even thickness is to be obtained.

As shown in Figure 3, the emulsion *f* is supplied to a tank *l* located beneath the roller *a*, journaled at *b*, and the dykes *e* are arranged in the tank *l* on the underside of the roller *a* to limit the width to which the emulsion is applied to the web *g*, whilst the surplus deposit from the emulsion is removed by the trailing stationary scraper blade *c* which is adjusted to produce the required smooth and even texture on the coated surface of the web *g*.

In the arrangement shown in Figure 4, a belt *a'* of elastic material (such as India rubber reinforced with textile material for example) is substituted for the roller *a* and its resilience has to comply with the same requirements as that of the roller *a*, said belt *a'* being supported on rollers *m* or in any other convenient way. A fountain or duct for containing the emulsion *f* (supplied to said fountain under pressure) is formed by the stationary scraper blade *c* and a wall *l'*, the width of the fountain or duct being defined by dykes *e* which can be adjusted sideways as desired within the dimensional limits of the construction.

In all cases the scraper blade *c* is mounted on a stock *n* and may consist of a single blade, which may be stiff or somewhat elastic, of stainless steel for example, secured in place by screws *n'* as shown in Figure 7 or of several blades *c'¹c'²c'³* forming a laminated structure as shown in Figure 8.

The stock *n* may be clamped to hold the scraper blade *c* at the required angle to and with the requisite pressure on the resilient surface of the elastic roller *a* to get the spreading action hereinbefore referred to but in some cases parts of the stock *n* may be mounted on a spindle *o* carrying a lever *p* connected to one end of a spring *q*, the other end of which is anchored to a stationary part of the machine structure, so that the spring *q* tends to move the edge of the scraper blade *c* away from the periphery of the roller *a*, and to provide a screw *k* to force the edge of the scraper blade *c* towards the periphery of the roller *a* as shown in Figure 7.

As the exceptionally thin smooth and even coating of fine texture produced by the improved method of coating is due to the resilient cooperation between the edge of the stationary scraper blade *c* and the moving surface of the elastic roller *a* or belt *a'* being balanced by the viscosity of the coating mixture it will be obvious that with

different coating mixtures, different pressures will have to be applied to obtain a coating of the required thickness.

In the arrangement shown in Figure 8, the edge of the scraper blade *c* is urged into contact with the surface of the roller *a* or belt *a'* by a spring such as *q* and is restrained by a stop screw such as *k*, the parts *q* and *k* being suitably anchored and mounted.

The actual construction of the roller *a* forms no part of this invention but it may be hollow, that is to say, in the form of a drum *a'* having an elastic sheathing *a''* of India rubber or other material, substantially unaffected by the emulsion and the operation of the machine in a practical way, of a consistency and thickness to provide the essential resilience of the roller and the web to give the required yielding cooperation with the scraper blade *c*.

As the web *g* is not water wetted by the applied emulsion its tensile strength (if of paper) is not materially affected, so that power may be applied to the rewind roll *j* sufficient to operate the machine, but usually the roller *a* or belt *a'* will be urged to relieve the stress in the web *g* and the stock roll *h* may have some power applied thereto.

Generally, it is necessary to apply more than one coating of emulsion to a given web *g* and to enable this to be done in a single operation, two, three, four, five, six or more hoppers each having a stationary scraper blade *c* mounted for exact adjustment, a wall *l'* and dykes *e* may be arranged in succession as shown in Figure 4, the belt *a'* being as long as required and being supported by rollers at the points of operation or alternatively, being air floated on a flat bed.

When a number of coatings have to be applied successively it may be found that the length of a machine as shown in Figure 4 is inconvenient, and in such case, the arrangement shown in Figure 5 should be used. In this arrangement *aaaa* are rollers usually of elastic material, *cccc* are the stationary trailing scraper blades which are arranged to act as fountains or ducts and receive pressure fed emulsion, *h* is the stock roll, *j* the rewind roll, and *t* are guide and jockey rollers for deflecting the web *g* to follow the path shown.

When both sides of a web *g* have to be coated this may be effected economically and rapidly by an arrangement such as is shown in Figure 6 in which there are two rollers *a* possessing the required resilience, and the web *g* passes from the left hand roller *a*, thence between the rollers *a* upwardly to the roller *t*, downwardly to the roller *t'* and then upwardly around the upper part of the right hand roller *a*, thence the web *g* passes downwardly to the rewind roll *j* so that one surface of the web *g* is exposed on the left hand roller *a* and the other surface of the web *g* is exposed on the right hand roller *a* as shown.

A trailing stationary scraper blade *c* is applied conveniently to each roller *a* to form two gutters *dd* which are fitted with dykes *e* as shown in Figure 6 so that as the web *g* passes from the roll *h* to the roll *j* firstly a coating is applied to one side of the said web, smoothed and finished by the cooperation of the blade and roller and then a coating is applied to the other side of the said web, smoothed and finished in turn by the cooperation of the other blade and roller, the length of the web between the points at which coating occurs being sufficiently spaced to provide for proper drying.

I claim:

1. A machine for coating absorbent continuous webs with a substance suspended in an oil phase emulsion containing finely divided water as the disperse phase, said machine comprising a relatively resilient movable support in contact with one surface of said web, means for supplying the emulsion to the moving surface of said web not in contact with said support and a stationary blade means including a knife edge portion and means to urge said knife edge portion resiliently into contact with the emulsion coated surface of said supported moving web.

2. The machine claimed in claim 1, in which said blade is laminated.

3. A machine for coating absorbent continuous webs with a substance suspended in an oil phase emulsion containing finely divided water as the disperse phase, said machine comprising a rotatable roller with a peripheral layer of India rubber, the external surface of which is in contact with one surface of said web, means for supplying the emulsion to the moving surface of said web not in contact with said external surface of

the peripheral layer of India rubber, and a stationary blade means including a knife edge portion, and means to urge said knife edge portion resiliently into contact with the emulsion coated surface of said supported moving web and yieldingly co-operating with said peripheral layer of India rubber.

4. A machine for coating absorbent continuous webs with a substance suspended in an oil phase emulsion containing finely divided water as the disperse phase, said machine comprising a rotatable roller, a peripheral layer of India rubber on said roller the external surface of said layer being in contact with one surface of said web, a stationary blade supported so as to trail on the emulsion coated surface of said web whilst descending, spring means urging the free edge of said blade into yielding co-operation with said peripheral layer of India rubber and marginal restrictors mounted on said blade intermediate of its ends to form a hopper of substantially triangular transverse cross section for the emulsion.

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