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PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) WRAPPING OF ARTICLES

(71) We, IMPERIAL CHEMICAL INDUSTRIES LIMITED, of Imperial Chemical House, Millbank, London, S.W.1., a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to machines for wrapping articles in webs and to the process for wrapping articles using such a machine.

Generally when articles are wrapped in webs of protective materials such as films of cellulose derivatives or films of thermoplastic materials, the webs used are coated with a material which will form a seal when two pieces of the web are pressed together and heated with the coating material therebetween. These coatings are expensive materials and thus it is wasteful to have to coat the whole surface of the web in order to effect a seal over only a small area of that surface.

It has already been proposed that a pattern of a heat-sealable wax may be printed onto a web to provide heat-sealable material along only the lines where the web is to be sealed. If this technique is used in a process in which the web is continuously fed through the coating unit, which may be a nip roll printing system, to the wrapping station it is essential that every complete print impression which is to be used to form one complete wrapper should be registered exactly when the web is cut and fed to the wrapping station. However, this is particularly difficult to achieve because it is not possible to machine a printing roller to an exactly required diameter and thus there will be minute errors in the registration of the pattern in the wrapping machine. These errors will be cumulative and may lead to the pattern becoming out of register over sustained running periods. Furthermore, it is necessary to use elaborate photoelectric registration devices

which are expensive and at times unreliable. If registration is not achieved the heat sealable material will not be present along the required position of the wrapper when it has been folded around the article and when this occurs the wrapper cannot be properly sealed; as it is essential that wrapping machines should be capable of use over sustained periods these techniques are not generally used. Webs coated over their entire surface are generally used, this is expensive as large amounts of coating material must be used.

The present invention provides a wrapping machine in which a web is continuously coated with a succession of patterns of a heat-sealable material and cut intermittently by a cutting device into sections each having a pattern of the heat-sealable material thereon which sections are fed to the wrapping station of the machine in which machine the web contacts a rotating printing roller from which said succession of patterns are applied to the web and the coated web is then fed positively to the cutting device by a means positioned between the printing roller and the cutting device said means being geared to the operation of the cutting device so that the sections of the web fed to the wrapping station are of the desired length, the operation of the cutting device also being geared to the printing roller so that each section of the web is coated with one complete pattern of the heat-sealable material and in which machine the web is urged onto the surface of the printing roller by virtue only of the tension in the web.

We have found that by urging the web on to the surface of the roller by virtue only of the tension in the web, the web may, if necessary, slip relative to the printing roller to ensure that there is one complete pattern of the heat-sealable material on each section of the web, the pattern will of course become slightly smudged. The means which grips the web at a position between the printing roller and the

cutting device and feeds it positively to the cutting device is preferably a pair of nip rollers geared to the cutting device.

5 The circumference of the printing roller is ideally equal to the length of or to a multiple of the length of a section of the web which should be fed to the wrapping station to form one wrapper. However, as stated above it is extremely difficult to machine a roller so that
10 its circumference is exactly that required. The printing rollers of the wrapping machines of our invention are therefore machined within specified tolerances so that the circumference of the roller is no greater than the length or
15 a multiple of the length of the single sections of the web that are fed to the wrapping station. Thus this will mean that the circumference of the roll is generally less than the theoretically ideal circumference. The circumference of the printing roller should not be greater
20 than the theoretical ideal because it would not then be possible for a length of web less than the circumference of the roller to pass the roller during one complete revolution thereof and still have the required pattern printed
25 thereon. Furthermore, the printing roller is geared to the knife to ensure that there is a complete pattern on each section of wrapping material and thus if the web were not able
30 to slip on the printing roller because the roller is oversized the sections of material fed to the wrapping station would be too long. This problem does not arise if the circumference of the printing roller is marginally less than
35 the theoretical ideal because the web will then be able to slip relative to the printing roller so that one complete pattern will be applied to the web for each cut of the knife.

40 The web is urged onto the printing roller by virtue only of the tension in the web so as to allow it to slip relative to the printing roller if necessary. Therefore, in our preferred machine the web is fed to the printing roller by passage beneath a roller whose lowermost
45 point is below the uppermost point of the printing roller, then over the printing roller and then beneath another roller whose lowest point is below the uppermost point of the printing roller. The rollers beneath which the
50 web passes after passing over the printing roller may conveniently be one of the pair of nip rollers which act as the means which feeds the web positively to the cutting knife.

55 The present invention is directed to applying coatings of heat sealable materials to webs as they are being fed to the wrapping station of a wrapping machine. The pattern of the heat-sealable material that should be printed onto the web will depend upon the shape and
60 form that the package is to take. The material should, however, be printed on the parts of the web which are overlapped with other parts of the web in the wrapping machine so that the overlapping portions may be sealed together

by the application of heat and pressure. The preferred form of heat sealable material is one that may be applied to the web as a melt and which will dry quickly on the web so that the coating will not be tacky when the web is gripped by the means which controls the speed of travel of the web and feeds it positively to the cutting device. Thus, the preferred heat sealable materials are hot melt adhesives which are kept molten by heating them in a bath from which they may be transferred to the printing roller and then transferred as a pattern onto the web. These hot melt adhesives will set and solidify quickly and it may therefore be necessary to heat the printing roller to above the melting temperature of the heat-sealable material to prevent the material setting on the printing roller, the printing roller may conveniently be heated by passing a heated fluid through the centre thereof.

The printing roller may be any suitable roller which transfers the desired pattern of heat-sealable material to the web. Conveniently the printing roller is an engraved roller, preferably a gravure roller which rotates in contact with a source of the heat-sealable material; for example, the roller itself may dip into a bath of the heat-sealable material or may rotate in contact with another roller which itself dips into such a bath. The printing roller is engraved to provide depressions on its surface corresponding to the pattern that is to be printed on the web and a device such as a doctor knife is provided which removes the heat-sealable material other than such material in these depressions from the roller surface before the roller contacts the web. The diameter of the printing roller should be such that at least one whole pattern of the heat-sealable material is printed on the length of the web which forms one wrapper. Alternatively two or more patterns may be engraved on the surface of the roller. In our preferred wrapping machine the cutting device consists of a knife mounted on a roller and the speed of rotation of this roller is geared to both the speed of rotation of the printing roller and also the speed at which the means feeds the film positively.

Any types of web material that are used in the production of wrappers which are heat sealed around an article may be used in our wrapping machines. Typical web materials include paper, films of cellulose derivatives and films of thermoplastic materials especially polypropylene and in particular biaxially oriented polypropylene film. The choice of the heat-sealable material will depend upon the nature of the web and the temperatures at which the wrapper is to be sealed. The present invention has the added advantage that uncoated material may be used as the raw material for the web and, as it is not necessary to wind the coated web into a reel, pressure sensitive adhe-

sives that would otherwise cause adjacent layers in a reel to stick to each other may be used as the heat-sealable material.

The present invention is applicable to any form of wrapping machine in which goods are wrapped in a web which is secured around the goods by heat-sealing. The source from which the web is fed generally comprises a reel of the web from which the web is withdrawn and the nature of the wrapping station depends upon the goods that are being wrapped. For example if boxes such as cigarette packets are being wrapped, the wrapping station comprises a device which folds the sections of the coated web around the box with portions of the wrapper overlapping each other and these overlapping portions are then sealed to each other by the application of heat and pressure. Alternatively the wrapping station may consist of a "form-fill" device in which the web is formed into a bag into which goods, such as sweets or potato crisps are fed.

The present invention is illustrated but in no way limited by reference to the drawing accompanying the Provisional Specification which is a diagrammatic representation of a wrapping machine.

In this drawing a web 1 is fed from a reel 2 in the direction shown by the arrow and passes around a tensioning roller 3. The web then passes into contact with a printing roller 4 which is driven in the direction shown by the arrow and then around a tensioning roller 5.

The web then passes between a rotating cutting blade 6 and a stationary blade 7 so that the web is cut one or several times each time the roller 4 completes one revolution. The individual pieces of the web are then fed to the wrapping station (not shown).

The printing roller 4 is engraved and rotates with its lower part in a bath of heat sealable material 9 so that as it rotates it picks up the heat sealable material on to its surface. The coating on all parts of the roller surface except in the engraved portions is removed from the roller by a doctor knife 10 and at least some of the material in the engraved portions is transferred from the roller 4 onto the web 1.

The printing roller 4 is geared to a driven nip roller 8 and to the knife 6 so that each section of the web fed to the wrapping station has the required pattern of heat-sealable material thereon and is of the length required to form one package. The circumferential length of one complete engraved pattern on the coating roller 4 defines the gear ratio between the knife and the nip roller 8. The drive of roller 8 is geared so that the circumferential distance travelled by roller 8 during one complete rotation of the knife is near as possible equals

the circumferential length of a complete engraved pattern on roller 4.

WHAT WE CLAIM IS:—

1. A wrapping machine in which a web is continuously coated with a succession of patterns of a heat-sealable material and cut intermittently by a cutting device into sections each having a pattern of the heat-sealable material thereon which sections are fed to the wrapping station of the machine in which machine the web contacts a rotating printing roller from which said succession of patterns are applied to the web and the coated web is then fed positively to the cutting device by a means positioned between the printing roller and the cutting device said means being geared to the operation of the cutting device so that the sections of the web fed to the wrapping station are of the desired length, the operation of the cutting device also being geared to the printing roller so that each section of the web is coated with one complete pattern of the heat-sealable material and in which machine the web is urged onto the surface of the printing roller by virtue only of the tension in the web.

2. A wrapping machine according to Claim 1 in which the means positioned between the printing roller and the cutting device which feeds the web positively comprises a pair of driven nip rolls the speed of rotation of which is geared to the cutting device.

3. A wrapping machine according to Claim 1 or Claim 2 in which the printing roller has a circumference less than the length of a section of the web that is to be fed to the wrapping station of the machine.

4. A wrapping machine according to any of the preceding Claims in which the web is urged onto the printing roll by passage beneath a first roller whose lowermost point is below the uppermost point of the printing roller, then over and in contact with the printing roller and then beneath a second roller whose lowest point is below the uppermost point of the printing roller.

5. A wrapping machine according to Claim 4 in which the second roller is the upper roll of a pair of nip rolls which make up the device which feeds the coated web positively to the cutting device.

6. A wrapping machine according to any of the preceding Claims in which the printing roller comprises a gravure cylinder.

7. A wrapping machine according to Claim 6 provided with a bath for the heat-sealable material into which the printing roller is partially immersed.

8. A wrapping machine according to Claim 6 in which the bath is heated to melt the heat-sealable material.

9. A wrapping machine according to any of Claims 1 to 6 provided with a bath for

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sives that would otherwise cause adjacent layers in a reel to stick to each other may be used as the heat-sealable material.

5 The present invention is applicable to any form of wrapping machine in which goods are wrapped in a web which is secured around the goods by heat-sealing. The source from which the web is fed generally comprises a reel of the web from which the web is withdrawn and the nature of the wrapping station depends upon the goods that are being wrapped. For example if boxes such as cigarette packets are being wrapped, the wrapping station comprises a device which folds the sections of the coated web around the box with portions of the wrapper overlapping each other and these overlapping portions are then sealed to each other by the application of heat and pressure. Alternatively the wrapping station may consist of a "form-fill" device in which the web is formed into a bag into which goods, such as sweets or potato crisps are fed.

15 The present invention is illustrated but in no way limited by reference to the drawing accompanying the Provisional Specification which is a diagrammatic representation of a wrapping machine.

25 In this drawing a web 1 is fed from a reel 2 in the direction shown by the arrow and passes around a tensioning roller 3. The web then passes into contact with a printing roller 4 which is driven in the direction shown by the arrow and then around a tensioning roller 5.

35 The web then passes between a rotating cutting blade 6 and a stationary blade 7 so that the web is cut one or several times each time the roller 4 completes one revolution. The individual pieces of the web are then fed to the wrapping station (not shown).

40 The printing roller 4 is engraved and rotates with its lower part in a bath of heat sealable material 9 so that as it rotates it picks up the heat sealable material on to its surface. 45 The coating on all parts of the roller surface except in the engraved portions is removed from the roller by a doctor knife 10 and at least some of the material in the engraved portions is transferred from the roller 4 onto the web 1.

50 The printing roller 4 is geared to a driven nip roller 8 and to the knife 6 so that each section of the web fed to the wrapping station has the required pattern of heat-sealable material thereon and is of the length required to form one package. The circumferential length of one complete engraved pattern on the coating roller 4 defines the gear ratio between the knife and the nip roller 8. The drive of roller 8 is geared so that the circumferential distance travelled by roller 8 during one complete rotation of the knife as near as possible equals

the circumferential length of a complete engraved pattern on roller 4.

WHAT WE CLAIM IS:—

65 1. A wrapping machine in which a web is continuously coated with a succession of patterns of a heat-sealable material and cut intermittently by a cutting device into sections each having a pattern of the heat-sealable material thereon which sections are fed to the wrapping station of the machine in which machine the web contacts a rotating printing roller from which said succession of patterns are applied to the web and the coated web is then fed positively to the cutting device by a means positioned between the printing roller and the cutting device said means being geared to the operation of the cutting device so that the sections of the web fed to the wrapping station are of the desired length, the operation of the cutting device also being geared to the printing roller so that each section of the web is coated with one complete pattern of the heat-sealable material and in which machine the web is urged onto the surface of the printing roller by virtue only of the tension in the web.

2. A wrapping machine according to Claim 1 in which the means positioned between the printing roller and the cutting device which feeds the web positively comprises a pair of driven nip rolls the speed of rotation of which is geared to the cutting device.

3. A wrapping machine according to Claim 1 or Claim 2 in which the printing roller has a circumference less than the length of a section of the web that is to be fed to the wrapping station of the machine.

4. A wrapping machine according to any of the preceding Claims in which the web is urged onto the printing roll by passage beneath a first roller whose lowermost point is below the uppermost point of the printing roller, then over and in contact with the printing roller and then beneath a second roller whose lowest point is below the uppermost point of the printing roller.

5. A wrapping machine according to Claim 4 in which the second roller is the upper roll of a pair of nip rolls which make up the device which feeds the coated web positively to the cutting device.

6. A wrapping machine according to any of the preceding Claims in which the printing roller comprises a gravure cylinder.

7. A wrapping machine according to Claim 6 provided with a bath for the heat-sealable material into which the printing roller is partially immersed.

8. A wrapping machine according to Claim 6 in which the bath is heated to melt the heat-sealable material.

9. A wrapping machine according to any of Claims 1 to 6 provided with a bath for



- the heat-sealable material from which heat-sealable material is transferred to the printing roller by an intermediate roller which dips in the heat-sealable material and contacts the printing roller.
- 5 10. A wrapping machine according to Claim 9 in which the bath is heated to melt the heat-sealable material.
- 10 11. A wrapping machine according to any of Claims 6 to 10 provided with a doctor knife to remove any excess heat-sealable material from the printing roller before it contacts the web.
- 15 12. A wrapping machine according to any of the preceding Claims in which more than one engraved pattern is formed on the surface of the printing roller and the speed of rotation of the printing roller and the operation of the cutting knife are so geared that a single complete pattern is applied to each section of the web.
- 20 13. A wrapping machine according to any of the preceding Claims in which the heat-sealable material is applied to the web as a melt and the coating roller is heated to above the melting temperature of the heat sealable material.
- 25 14. A wrapping machine substantially as hereinbefore described with particular reference to the drawing accompanying the Provisional Specification.
- 30 15. A process for supplying sections of wrapping material coated with a pattern of heat sealable material to the wrapping station of a wrapping machine comprising continuous-
- ly drawing a web of the material positively over a rotating printing roller from which a succession of patterns of the heat sealable material are applied to the web and feeding the pattern coated web through a cutting device where it is intermittently cut into sections each of which is coated with one complete pattern of the heat sealable material, in which the web is urged onto the printing roller only by virtue of the tension in the web and in which means feeding the web to the cutting device are provided between the printing roller and the cutting device and the operation of the cutting device is geared to both the means which feeds the web to the cutting device and to the peripheral speed of the printing roller so that each section of the web fed to the wrapping station is the required length and is coated with one complete pattern of the heat-sealable material.
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16. A process according to Claim 15 in which the web is of a thermoplastic material.
17. A process according to Claim 15 or Claim 16 in which the web is of biaxially oriented polypropylene.
18. A process according to any of Claims 15 to 17 in which the heat-sealable material is applied to the web as a hot melt.
19. A process according to any of Claims 15 to 18 substantially as hereinbefore described with particular reference to the drawing accompanying the Provisional Specification.
- P. C. BAWDEN,
Agent for the Applicants.

