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JP 600257228 A **JP 100316779 A**
US 4863670 A **US 20040076818 A**

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INT CL[7] **B05B, B29C**
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(54) Abstract Title: **Biaxial orienting a wet film for packaging**

(57) Processing a film prior to sealing a tray using the film. The film is processed by the application of an even layer of water prior to the film being stretched both along the length and across the width of the film.

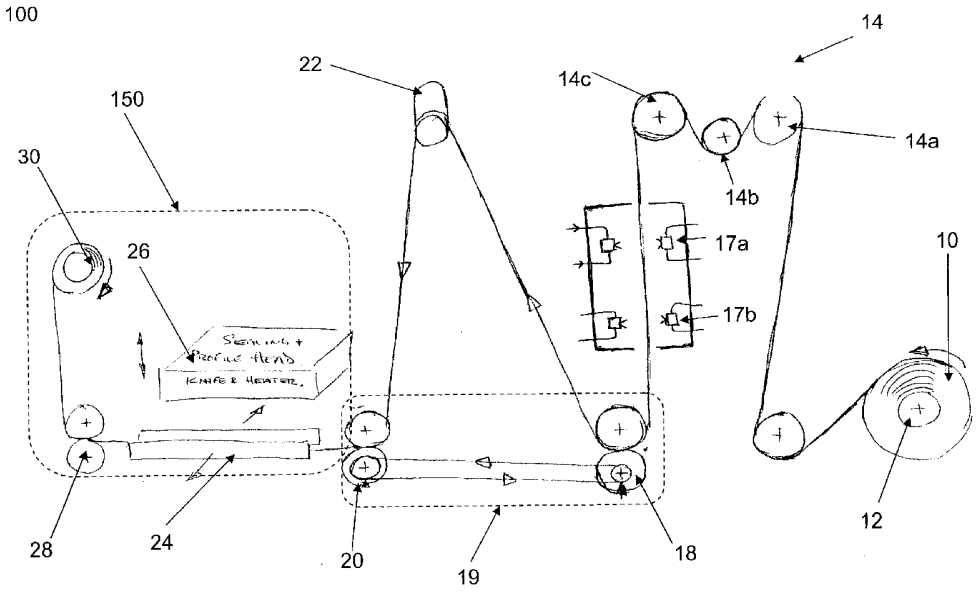


Figure 1

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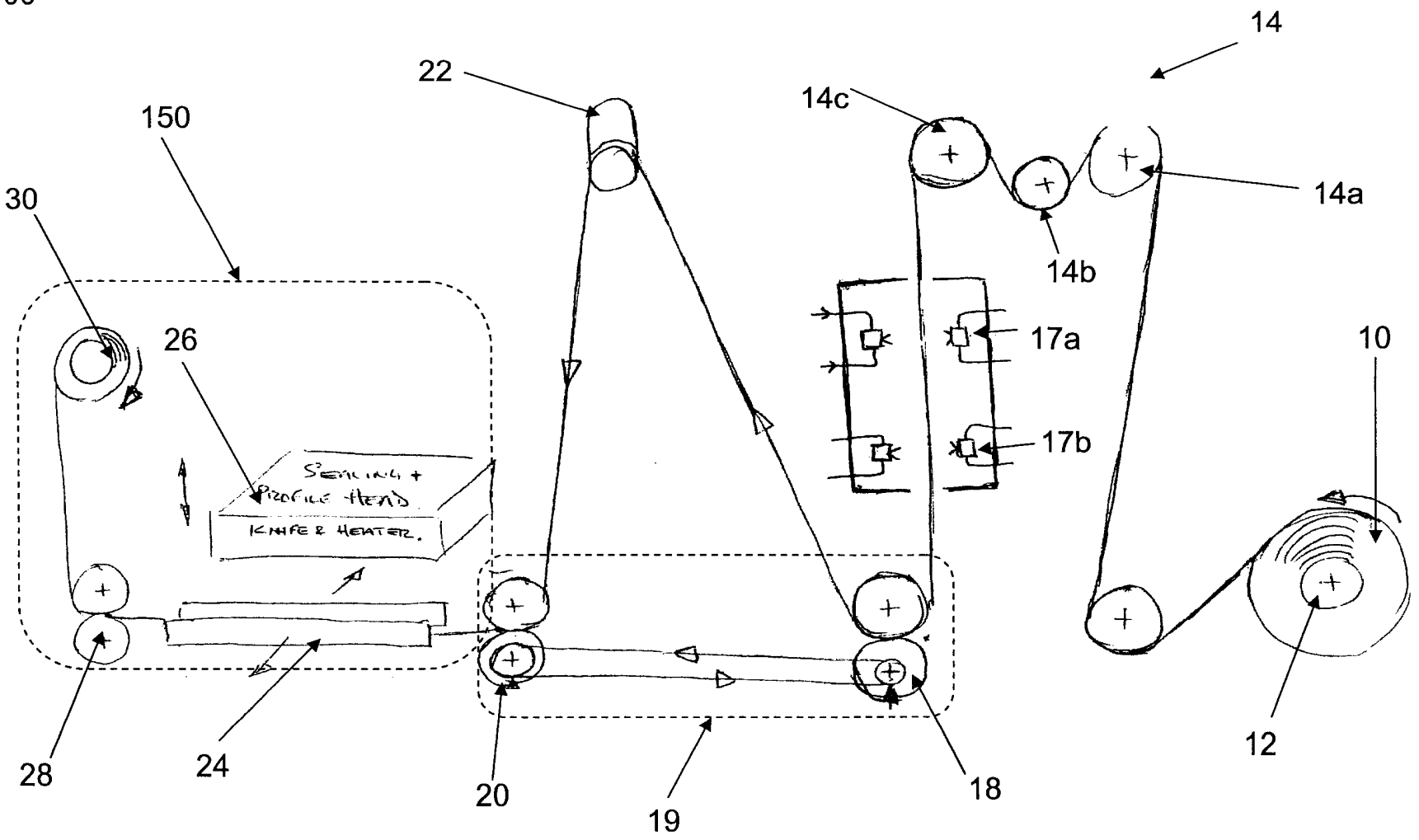

14
22
14c
150
14a
30
14b
26
17a
10
17b
SENSING +
PROFILE HEAD
KNIFE & HEATER.
28
24
20
19
18
12

Figure 1

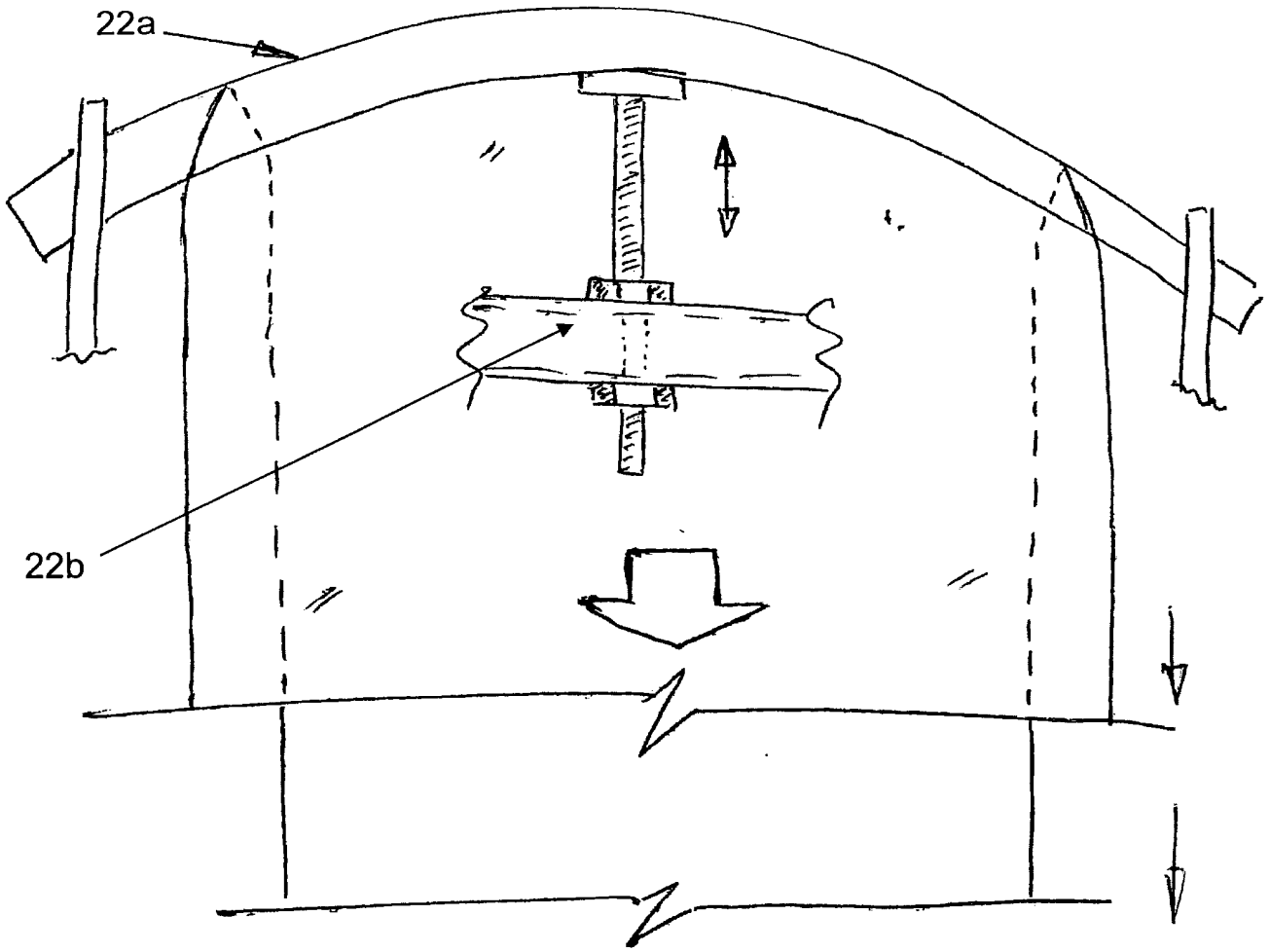


Figure 2

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METHOD AND APPARATUS

The present invention relates to a method and apparatus for processing a film and in particular to a method and apparatus for processing a film for use in sealing rigid trays and the like.

Fresh foods, such as fruit and vegetables, are often sold in rigid plastic trays or punnets that are sealed using a plastic film to protect the food from dirt and contamination. The containers are either gas-purged, for example for meat products, or in the case of fruit and vegetables are perforated. Fresh produce, such as fruit and vegetables, has a high water content and the produce gives off water vapour which will cause the produce to perish if the plastic film does not contain perforations to allow the moisture to pass through. This increases the time period for which the food may be stored before consumption.

Some semi-permeable organic films, one example of which is Enpol, which is manufactured by Polyval Limited, do not require perforation as the structure of the film allows vapour to pass through the film into the external environment and it is believed that this will lead to significant increases in the time that the food will remain edible as the produce creates its own atmosphere within the tray. It has been observed that some of these films have a tendency to sag due to absorption of moisture by the film and if the film were to come into contact with the food then this will lead to a decrease in the time for which the food is still edible.

According to a first aspect of the present invention there is provided an apparatus for processing a film, the apparatus comprising: means for applying a layer of liquid to the film; means for straining the film in a first direction; and means for straining the film in a second direction, the second direction being substantially perpendicular to the first direction.

According to a second aspect of the present invention there is provided a method of processing a film, the method comprising the steps of: applying a layer of liquid to the film; straining the film in a first direction; and straining the film in a second direction, the second direction being substantially perpendicular to the first direction.

The invention will now be described, by way of example only, with reference to the following Figures in which:

Figure 1 shows a schematic depiction of an apparatus according to the present invention; and
Figure 2 shows a schematic depiction of the second straining means shown in Figure 1.

Figure 1 shows a schematic depiction of an apparatus 100 according to the present invention. The apparatus 100 comprises storage roller 12, on which is stored a roll of film 10. The film is passed into a pre-tensioning assembly 14, which comprises three rollers 14a, 14b & 14c, and then passes through treatment unit 16, which comprises a number of nozzles 17a, 17b, ..., each of which is connected to a source of water and compressed air. the film is then passed through a first set of rollers 18 and a second set of rollers 20,

which together comprise the first straining means 19, which act to strain the film along its length. Intermediate the first set of rollers 18 and the second set of rollers 20 the film passes through second straining means 22 (described below with reference to Figure 2), which acts to strain the film across its width.

The film then passes into a sealing unit 150, which is a modified conventional unit. The sealing unit 150 comprises one or more pairs of clamps which can grasp the sides of the film and strain then across their width. The sealing unit further comprises a sealing head 26 which presses the film against the uppermost periphery of a tray (or punnet) to seal the tray with the film. The sealing head may comprise heating means to seal the film against the tray and/or cutting means to remove excess film from around the tray. The unused film is removed from the sealing head via haul-off rollers 28 and is then stored on winding reel 30.

Figure 2 shows a schematic depiction of the second straining means 22 shown in Figure 1. The second straining means comprises deformable member 22a and deforming means 22b. The position of the deforming means 22b determines the extent of the curvature of the deformable member 22a, and in turn this determines the extent to which the film is strained.

In use, a continuous length of film 10 is pulled from the storage roller and passes through the pre-tensioning assembly, which exerts a tension of on the film, the value of the tension being dependent on the properties of the film and the material to be packed. The film then passes through the treatment unit 16, in which the film is treated with an

atomised spray of water. Preferably a plurality of nozzles are provided such that both sides of the film are sprayed with water and such that all of the film passing through the unit is sprayed with water.

The film then passes through the first set of rollers 18. The first set of rollers is a part of the first straining means 19 but also act to disperse the sprayed water evenly over the surface of the film and to remove any excess water from the film. It has been found that forming the first set of rollers to have a rubber surface adequately disperses the water and removes any excess.

It has been found that for some films, the additional of a film of water enables the film to be processed by stretching such that when the film is used to seal a tray, further contact with water does not lead to unwanted sagging and/or extension of the film, which leads to a decreased shelf-life for food products stored within the tray. The film is stretched along its length using the first straining means 19, which comprises the first set of rollers 18 and the second set of rollers 20. The first set of rollers 18 and the second set of rollers 20 are driven such that the second set of rollers are rotated at a rotational speed that is greater than the rotational speed of the first set of rollers 18. This differential in speed is sufficient to cause the film to be strained along its length.

The film is stretched across its width by the second straining means. Figure 2 shows the film 10a which is being fed into the second straining means under tension (due to the action of the straining means. As the film passes over the

deformable member, the arcuate form of the deformable member causes the film to be stretched across its width such that the film 10b that leaves the second straining means has a greater width than film 10a entering the second straining means. The geometry of the deformable member is defined by the position of the deforming means and this determines the extent to which the width of the film is increased by.

It has been observed that for some films there is a tendency for the extension in width to relax after the film leaves the second straining means (the relaxation may be partial or may be entire such that the film relaxes to its width prior to entering the second straining means. It has been found that this relaxation is easily compensated for when sealing a tray using the film. Clamps 24 seize both sides of the film and extend the film back to the required strain. The film is then used to seal a tray in a conventional manner, with the application of heat and/or pressure to seal the film. Cutting means, such as knives, are provided to remove excess film from the tray and unused film is removed and stored on reel 30. As is conventional, the sealing unit may seal a number of trays in parallel and thus the film would be cut into a number of parallel sections, with appropriate clamping and sealing means being provided for each section.

The film for use with the invention is conventionally from 15 μm to 150 μm thick and has a width typically between 100 mm and 900 mm. The film will be typically supplied in a roll having an external diameter of 200 mm and a weight of up to 20 kg. It will be readily appreciated that as the width of the film and the thickness of the film increases, the force that is required to provide a desired strain increases.

The film will be advanced through the apparatus at speeds that are used with conventional packaging and sealing systems, for example between 0.5 m/min and 6 m/min.

The extent to which the film is strained will be in part dependent upon the foodstuff that is to be packaged by the film and the extent to which water vapour is released by the foodstuff, but it is believed that a strain of up to 40% will be adequate for most applications, for both strain along the length and across the width of the film. The invention is of particular use with water-soluble films, for example those made from a polyvinyl alcohol (PVAL) material, such as Enpol, for example, which is made by Polyval Limited, or films made by Ecofresh Limited. It is believed that the invention is also suitable for use with sugar- and starch-based organic or degradable films.

It will be readily apparent to the person skilled in the art that the apparatus described above may be modified to provide the same result. For example, the treatment unit may comprise a first set of rollers that introduce water onto the film and a second set of rollers that disperse the water and remove any excess. Furthermore, the first set of rollers may comprise a set of contact rollers and further roller(s) that transfer water to the contact rollers such that the water is brought into contact with the film. For a treatment unit as described above with reference to Figure 1, it has been found that a suitable volume of water is 0.1 to 0.4 litre/minute, atomised with 1-15 litre/minute of air pressurised to between 5-65 psi (34 - 448 kPa). It will be understood that other fluids may be used in addition to or as an alternative to water.

The first and second sets of rollers which together comprise the first straining means are driven at different speeds to strain the film along its length. It has been found that a speed difference of up to 15% provides the desired range of strain. It will be understood that the first and second sets of rollers may be driven using separate drive means or that both sets of rollers may be driven together, with an appropriate gearing being used to provide the desired differential speed. If the apparatus is used in temperature controlled environment then it may be necessary to add one or more heating means to the apparatus to allow the film to be processed.

CLAIMS

1. An apparatus for processing a film, the apparatus comprising:

means for applying a layer of liquid to the film;

means for straining the film in a first direction; and

means for straining the film in a second direction, the second direction being substantially perpendicular to the first direction.

2. An apparatus according to claim 1, further comprising means for pre-tensioning the film prior to the film, in use, being introduced to the means for applying a layer of liquid.

3. An apparatus according to claim 1 or claim 2, wherein the means for applying a layer of liquid to the film comprises one or more nozzles, the or each of the nozzles being supplied with a source of liquid and gas.

4. An apparatus according to claim 3, wherein the nozzles are configured to provide an atomised spray of liquid.

5. An apparatus according to claim 3 or claim 4, wherein dispersal means are provided to disperse the liquid across the film.

6. An apparatus according to claim 5, wherein the dispersal means are further configured to remove excess liquid from the film.

7. An apparatus according to any preceding claim, wherein the means for straining the film in a first direction comprise a first set of rollers and a second set of rollers, in use the second set of rollers are rotated at a greater speed that the first set of rollers.

8. An apparatus according to claim 7, wherein the means for straining the film in a first direction comprises a geared connection between the first set of rollers and the second set of rollers, such that driving one of the set of rollers causes the other set of rollers to rotate.

9. An apparatus according to claim 8, wherein the geared connection between the first set of rollers and the second set of rollers determines the relative speed of the sets of rollers.

10. An apparatus according to any preceding claim, wherein the means for straining the film in a second direction comprises a deformable member disposed substantially perpendicular to the film and means for deforming the deformable member.

11. An apparatus for sealing a tray using a film, the apparatus comprising the apparatus according to any of claims 1 to 10 and further comprising:

clamping means to, in use, clamp the sides of the film;

tensioning means to, in use, strain the clamped film in the second direction; and

sealing means to, in use, seal the film to the perimeter of a tray.

12. An apparatus according to claim 11, wherein the sealing means comprises:

means to impel the film against the perimeter of the tray; and

cutting means to remove excess film from the tray.

13. An apparatus according to claim 11 or claim, wherein the sealing means further comprises heating means to seal the film against the perimeter of the tray.

14. A method of processing a film, the method comprising the steps of:

applying a layer of liquid to the film;

straining the film in a first direction; and

straining the film in a second direction, the second direction being substantially perpendicular to the first direction.

15. A method according to claim 14, further comprising the step of pre-tensioning the film prior to the application of the layer of liquid to the film.

16. A method according to claim 14 or claim 15, wherein the step of applying a layer of liquid to the film comprises supplying a source of liquid and gas to one or more nozzles.

17. A method according to claim 16, wherein the nozzles provide an atomised spray of liquid.

18. A method according to claim 16 or claim 17, comprising the further step of dispersing the liquid across the film.

19. A method according to claim 18, comprising the further step of removing excess liquid from the film.

20. A method according to any of claims 14 to 19, wherein the film is strained in a first direction by passing the film trough a first set of rollers and a second set of rollers wherein the second set of rollers are rotated at a greater speed than the first set of rollers.

21. A method according to any of claims 14 to 20, wherein the film is strained in a second direction by passing the film over a deformable member disposed substantially perpendicular to the film, the deformable member being configurable for deforming the deformable member.

22. A method for sealing a tray using a film, the method comprising the steps of the method according to any of claims 14 to 21 and further comprising the steps of:

clamping the sides of the film;

straining the clamped film in the second direction; and

sealing the film to the perimeter of a tray.

23. A method according to claim 22, wherein the step of sealing the film to the perimeter of a tray comprises:

impelling the film against the perimeter of the tray; and

cutting excess film from the tray.

24. A method according to claim 22 or claim 23, wherein the step of sealing the film to the perimeter of a tray further comprises:

heating the film to seal the film against the perimeter of the tray.

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Application No:	GB0509526.0	**Examiner:**	Mr Robert Black
Claims searched:	1-24	**Date of search:**	1 August 2005

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1 and 14 at least	JP 10316779 A (KUREHA) see especially WPI abstract 1999-076540
X	1 and 14 at least	JP 60257228 A (UNITIKA) see especially WPI abstract 1986-038162
X	1 and 14 at least	US 2004/0076818 A (JANSSENS) see especially paragraphs 0061 and 0062
X	1 and 14 at least	US 4863670 A (HOJ) see especially figure 1, the abstract and column 2 lines 41-48

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

B2L; B5B

Worldwide search of patent documents classified in the following areas of the IPC^{07}

B05B; B29C

The following online and other databases have been used in the preparation of this search report

EPODOC; WPI