

**THE JOINT EXAMINATION BOARD**

**PAPER P6**

**INFRINGEMENT AND VALIDITY OF UNITED KINGDOM PATENTS**

**13<sup>TH</sup> NOVEMBER 1996**

**10:00 a.m. - 2:00 p.m.**

Please read the instructions carefully. This is a **FOUR HOUR Paper.**

1. Write on one side of the paper only using **BLACK** ink. You must write your examination number and the designation of the Paper (P6) in the top right hand corner of **EACH** sheet. You must not state your name anywhere in your answer.
2. **NO** printed matter or other written material may be taken into the examination room.
3. Answers **MUST** be legible. If the examiners cannot read a candidate's answer no marks will be awarded.
4. Candidates are reminded that marks are awarded more for the points selected for discussion and the reasoning displayed than conclusions reached.

Documents supplied:-

Client's letter (2 pages)

European Patent No. 094000 (6 pages and 2 sheets drawings)

Extract from X-PRESS I manual (1 page and 2 sheets drawings)

US Patent No. 7070707 (1 page and 1 sheet drawings)

X-PRESS II leaflet (1 page and 1 sheet drawings)

**18 PAGES INCLUDING THIS FRONT SHEET**

## CLIENT'S LETTER

The Vice-President of Sales and Marketing of your U.S. client writes the following letter to you:

5 Dear Sirs,

My company, X-Press Inc, is in the business of manufacturing and selling machines for dewatering materials, particularly slurries such as are by-products of agriculture and paper making industries. We have been in this business for 20 years.

We are presently manufacturing and selling in the USA, a dewatering machine as shown in the attached advertising leaflet. We are going to launch this machine (X-Press II) in the UK next week at the Royal Show and these leaflets have been sent in advance to our distributors and previous customers. We intend to demonstrate the machine in operation at the show.

15 We require advice concerning a disturbing letter we received two days ago from a competitor of ours, Dungking plc. Dungking plc claim that our new machine will infringe their European patent no. 094000 (as copy enclosed) and that they will take action to prevent our demonstration if we do not undertake to withdraw from the Show.

20 We have looked at the '000 patent and we do not think it covers our machine. Our machine is much simpler than that shown in their drawings. In fact our new machine is only a modification of a machine (X-Press I) which we have sold in the UK for the past 10 years. We enclose an extract from our operating manual for the old machine. The main difference is that we added a wire which is set about 1cm from the roller and which continuously removes solid material from the roller. The brush behind the roller sweeps up the solid material from the dewatering screen out into a collection tank. The advantage is that the solid material scraped from the roller when it has gone beyond the  
25 dewatering screen does not fall back on to the dewatering screen. We did not think there was anything new in this, since we did a patent search about 2 years ago which brought up US Patent No. 7070707 (granted 1986) which shows a "scraper wire", and as a result we decided not to file a patent application.

30 The other modifications we made were minor and aimed at simplifying the manufacturing process to cut costs.

It will be a significant blow to us if we are not able to launch our new product at the Royal Show. Please advise as to our position, what action we have to take if any and what action we can take against Dungking plc.

5 Yours faithfully.

You should advise your client on the infringement and validity of the European patent (UK) **solely with regard to the United Kingdom**, including advice on the action that your client can take, if any, making reference only to the materials provided herein. Your advice may be in the form of notes for advising your client or a letter addressed to the client and should be clearly distinguishable from the work products used to construct the infringement and validity opinion.

You establish the following facts:

- 15 the European Patent Office on-line register shows that the patent was granted 3 months ago.  
the first communication from the European Patent Office was the Rule 51(4) EPC communication.  
The Patentee did not voluntarily amended the claims.  
All fees have been timely paid.  
The UK National Phase has been effected

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**EUROPEAN PATENT NO. 094000**

The present invention relates to apparatus for separating solid material from liquid and is concerned in particular, but not exclusively, with apparatus for separating fibrous solids from liquid in a waste such as farm slurries from pig, poultry, beef or dairy units.

One known separating apparatus used in sewage treatment plants commonly comprises a perforated screen which allows the liquid of the slurry to pass through the screen, but retains the more solid matter, and an arrangement of brushes which sweep across the screen. The screen is commonly curved into a segment of a cylinder, and the brushes are supported on arms which rotate about the axis of the cylinder so that a sweep of the brushes across the screen is produced by rotation of the arms. Usually, the purpose of the brushes is to sweep the remaining solid matter from the perforated screen over the edge of the perforated screen for disposal.

A disadvantage of such apparatus is that when farm slurries are in an undiluted state the solids are discharged in too wet a condition for easy handling, stacking and disposal.

According to the present invention there is provided separating apparatus, comprising a curved screen for separating solid material from a liquid in a slurry, compression means for expressing the liquid through the screen to effect the separation, sweeping means for sweeping solid material from the screen, and means for moving the compression means and the sweeping means across the screen in a cyclical movement, characterised in that the cycle has a first interval in which the compression means is moved across the screen and is urged against the screen and a second interval in which the compression means is removed from the screen to a position such that solid material collected on the compression means during the second interval can fall clear of the screen.

By "solid material" is meant material which has a higher solids content than the original slurry placed on the screen.

In a preferred arrangement the screen is in the form of a generally part-cylindrical surface arranged with an upwardly facing concave surface. During the first interval the compression means and sweeping means are urged against the concave surface of the part cylindrical screen and during the second interval the compression means and sweeping means follow substantially the path drawn by the remainder of the cylinder if it were present. The screen may be arranged in the form of a segment of a circular cylinder, and the compression means and sweeping means may be rotatably mounted on mounting means which in turn may be mounted for rotation about the axis of the said

cylinder to effect the said movement of the compression means and sweeping means across the screen.

The compression means preferably comprise a roller, rotatably mounted for movement across the screen.

5 The means for moving the roller is preferably a first mounting means arranged to move relative to the screen and a second mounting means coupling the roller to the first mounting means in a trailing position.

The first mounting means may comprise a pair of parallel, spaced apart arms mounted for rotation about the axis of a rotary mounting means. The second mounting means may comprise a further pair of parallel, spaced apart arms each pivotally coupled to a corresponding one of the first pair of arms in a trailing position relative to the direction of rotation of the first pair of arms.

There may further be provided means for scraping solid material off the roller during at least part of the said second interval. Preferably there is provided means for urging the scraper means against the roller during at least part of the said second interval while the roller is being rotated.

15 Preferably the scraper means is so arranged that it is not urged against the roller during the first interval while the roller is being moved across the screen and is being urged against the screen.

There may be provided a preparatory separating screen for effecting an initial separation of liquid from slurry before separation by the first mentioned screen, the preparatory screen being provided with a further sweeping means arranged to sweep over the preparatory screen and to transfer slurry from the preparatory screen to the first mentioned screen.

20 The or each sweeping means on one or both screens are preferably one or more brushes or blades.

Embodiments of the invention are further described by way of example with reference to the accompanying drawings in which :-

25 Figure 1 is a side view of separating apparatus embodying the invention;  
Figure 2 is an enlarged side elevation of a part of the apparatus of Fig. 1.

Referring to Figure 1 apparatus for separating solid fibrous material from slurry in, for example, farm effluent, comprises a main frame 11, and two perforated screens 12 and 13 suspended from the main frame 11. Mounted above each of the screens 12 and 13 are mounting means constituted by four arms 14 in the case of screen 12 and four arms 15 to 18 in the case of the screen

13. All of the arms are mounted for rotation about a shaft 19 for screen 12, and a shaft 20 for screen

13. The arms are duplicated on the far side of the screens, each forming a spaced apart pair.

A motor (not shown) drives the shafts 19 and 20.

Each pair of the arms 14 carries a brush 28 which is urged into contact with the screen 12 on  
5 rotation of the arms 14.

The slurry is fed to the screen 12 through an input 29, and liquid expressed by the brushes 28 passes through the screen 12 into a first liquid trough 30 having an outlet 30'.

The partially dewatered slurry is swept over the face of the screen 12 by the brushes 28 and is tipped over an end wall on to the screen 13. The arms 14 rotate in a clockwise direction.

10 Similarly, each of the pairs of arms 15 and 17 carries a brush 32.

Each of the arms 16 and 18, and their pairs, are constructed of two component arms which are pivoted together. A first component arm 33 of the arm 18 is integral with and opposite to a first component arm 34 of the arm 16. A further component arm 35 of the arm 18 is pivoted to the first arm 33 by a torsion bar 36 which is arranged to bias the arm 35 in an outward direction, trailing and  
15 at an angle to the arm 33. The component arm 34 of the arm 16 is pivoted to a further component arm 56 by a torsion bar 39 which effects a corresponding bias of the arm 56 outwardly.

Rotatably mounted at the end of the pair of arms 35 is a roller 38.

The roller may conveniently be made of resilient material such as rubber, and is so mounted that when the arm 18 is rotated so that the roller passes across the face of the screen 13, the roller is  
20 urged against the screen by the torsion bar 36 and expresses water from the material on the screen. The pair of arms 56 carry a corresponding roller 57 which is shown in its operating position.

Figure 2 shows a modification of the apparatus of Figure 1 in which scraper means are added to operate on the rollers. The arm 35 carries a short extension arm 41 as does the corresponding parallel arm. Pivoted between the two arms 41 is a scraper or doctor knife 42 which can pivot  
25 between a position in which the scraper is urged against the roller 38, and a position in which the scraper is maintained spaced from the roller 38. A corresponding scraper 43 is pivoted between two extension arms on the arms 56.

Figure 2 shows that the scraper is influenced by two biasing forces. When the arm 35 is in the full line position of Figure 2, a bias spring 45 coupled between the scraper 42 and the extension  
30 arm 41 biases the scraper 42 away from the roller 38. When the roller is in the dotted position of Figure 2, the bias of the spring 45 is overridden by the torsion bar 36 which causes a beam 47 to

press against an adjustment screw 53 on a rear extension arm 46 of the scraper 42. This pivots the scraper 42 to be urged against the roller 38. The scraper 43 of the arm 16 is biased towards the roller 57 in a corresponding manner. In Figure 2 the full line and dotted line illustrations of the arm show the two different positions of the scraper at different times in the cycle of the rotation of the arm.

When the roller 38 is moving across the screen 13, the arm part 35 is confined inwardly by the pressure of the roller 38 on the screen 13. This allows the tension spring 45 to bias the knife or scraper 42 away from the roller 38 and maintains it in a spaced apart position as shown.

In Figure 1 the screen 13 terminates at a position 49, but the outer sides of the screen are continued by tracks 50 which extend upwardly along a segment of a cylinder having a greater radius than the segment of the cylinder defining the general shape of the screen. When one of the rollers 38 or 57 passes beyond the point 49 it leaves the screen and bears against the tracks 50 which thus continue the rotation of the roller after it has left the screen 13. Since the tracks 50 are at a greater distance from the shaft 20 than the screen 13, the torsion bar 36 is able to urge the arm 18 in an outward direction to an extent sufficient to allow the scraper 42 to be urged against the roller 38 by the arm 47. This allows the scraper to scrape off material which has accumulated on the roller and the material falls down a sloping shoot 51 to an appropriate discharge vessel. When the dewatered material is scraped from the roller there is no possibility of it falling back into the still wet material on the screen 13.

## Claims :

1 Separating apparatus comprising a curved screen for separating solid material from a liquid in  
a slurry, compression means for expressing the liquid through the screen to effect the  
5 separation, sweeping means for sweeping solid material from the screen, and means for  
moving the compression means and the sweeping means across the screen in a cyclical  
movement, characterised in that the cycle has a first interval in which the compression means  
(38,57) is moved across the screen (13) and is urged against the screen (13), and a second  
interval in which the compression means (38,57) is removed from the screen (13) to a  
10 position such that solid material collected on the compression means (38,57) during the first  
interval is released from the compression means (38,57) during the second interval.

2 Apparatus according to claim 1 and further characterised in that the compression means  
(38,57) comprises a rotatably mounted roller.

3 Apparatus according to claim 2 and further characterised in that guide tracks (50) extend  
beyond the end of the screen (13) following a path of greater radius than the screen (13), to  
enable the solid material collected on the roller to fall clear of the screen (13) and the roller is  
15 urged against the guide tracks (50) in such a manner as to rotate the roller.

4 Apparatus according to claim 2 or 3 and further characterised in that the means for moving  
the roller comprises a pair of parallel, spaced apart arms (33) mounted for rotation about the  
axis of the screen (13) and a second pair of parallel, spaced apart arms (35) each pivotally  
coupled to a corresponding one of the first pair of arms (33), the roller being rotatably  
20 mounted between the second pair of arms (35) for rotation about its own axis and the roller  
and the roller is optionally driven by motorised means.

5 Apparatus according to any of claims 2 to 4 and further characterised in that scraper means  
(42) are provided for scraping solid material off the roller during at least part of the second  
30 interval.



- 6 Apparatus according to claim 5 and further characterised in that there is provided means for urging the scraper means (42) away from the roller during the first interval and against the roller during at least part of the said second interval while the roller is being rotated.
- 5 7. Apparatus according to any preceding claim and further characterised in that solid material released from the compression means (38,57) during the second interval falls clear of the screen.

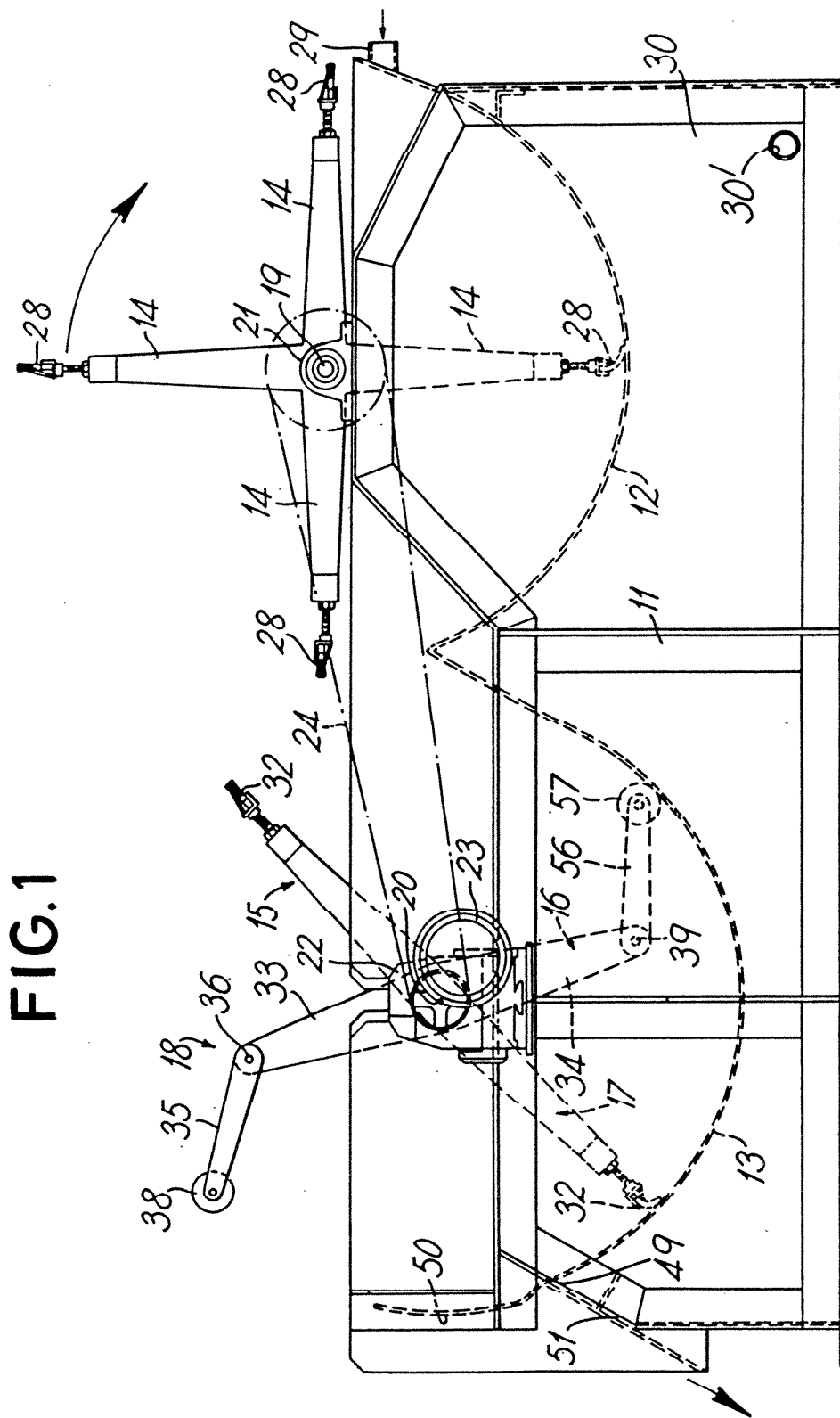
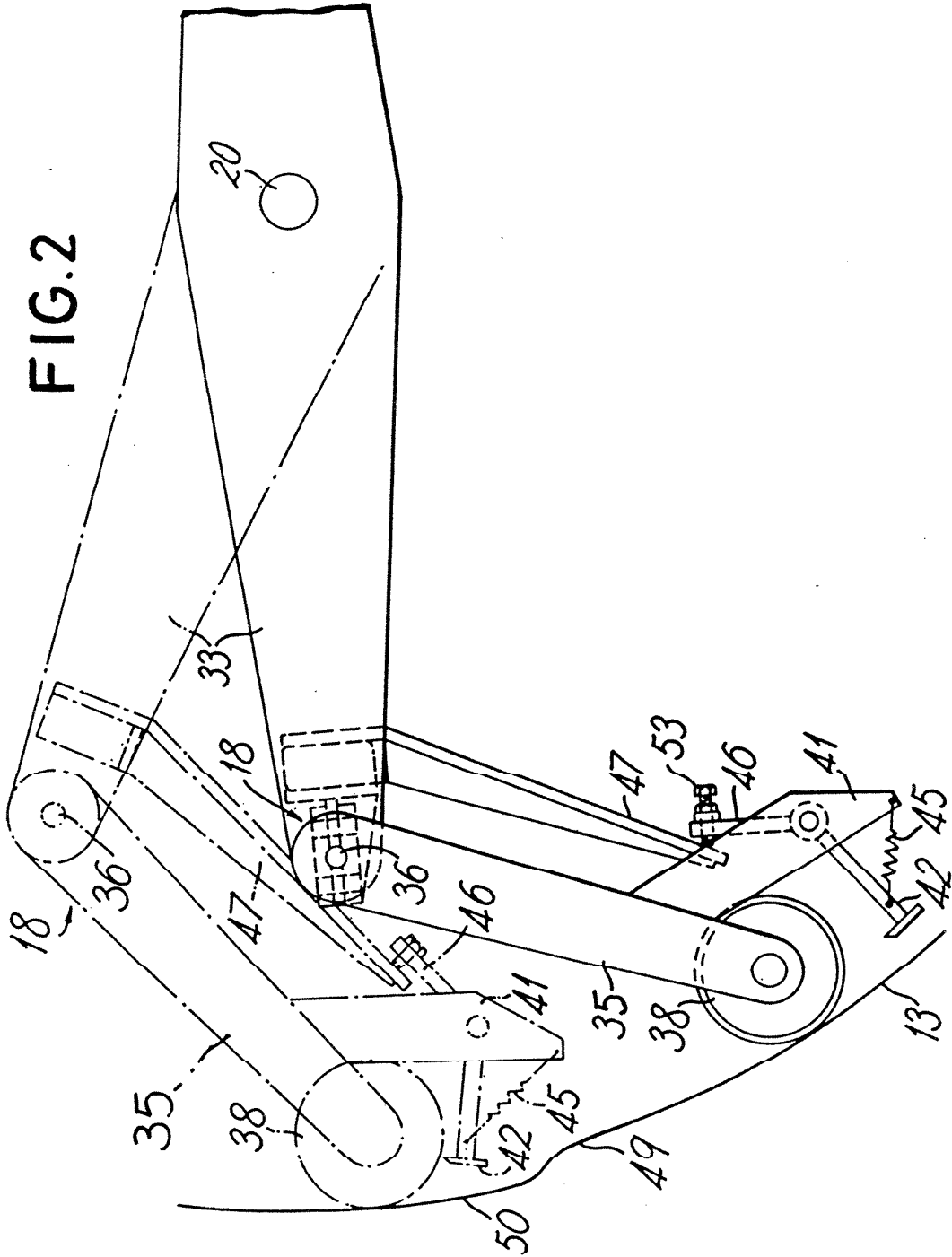


FIG. 1

FIG.2



**X-PRESS I**

## OPERATING INSTRUCTIONS

## 5 GETTING TO KNOW YOUR MACHINE.

- 1 perforated metal screen
- 2 rotor
- 3 shaft
- 10 4, 5 spider arms
- 6 torsion bush
- 7, 8 trailing arms
- 9, 10 rollers
- 11 input
- 15 12 discharge end
- 13 screen extension
- 14 discharge end wall
- 15 discharge ramp
- 16 discharge port
- 20 17 discharge lip
- 18 discharge chute
- 20, 21 spider arms
- 22, 23 brushes
- 24 perforated metal screen
- 25 25 rotor
- 26 shaft
- 27, 28 arms
- 29, 30 arms
- 31, 32 brushes
- 30 33, 34 brushes
- 35 35 slurry intake
- 41 41 chamber

## USING YOUR MACHINE

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The slurry to be dewatered is charged to the machine through the intake 35.

Brushes 31, 32, 33, 34 sweep the solid material over a perforated screen 24 allowing an initial dewatering. The solid material is swept over the input 11 onto the second screen 1. Rollers 9 and 10, supported between spaced parallel arms, pass over the solids and express remaining water. A certain amount of the solids stay on the rollers and the rest is swept up by the brushes 22 and 23. The leading edge of the continuing screen extension 13 lies inside the discharge lip 17 so that slurry solids coming off the rollers after they have passed the discharge port 16 are directed back onto the screen 1.

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The screen extension 13 has a progressively increasing radius and as each roller moves along the extension they move outwards until the arm is at this outermost extension. This controlled progressive outward deflection of the rollers on the trailing arms prevents the rollers and arms from suddenly jerking outwards as the roller leaves the screen and thereby preventing scattering of slurry solids adhering to the roller.

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FIG.1

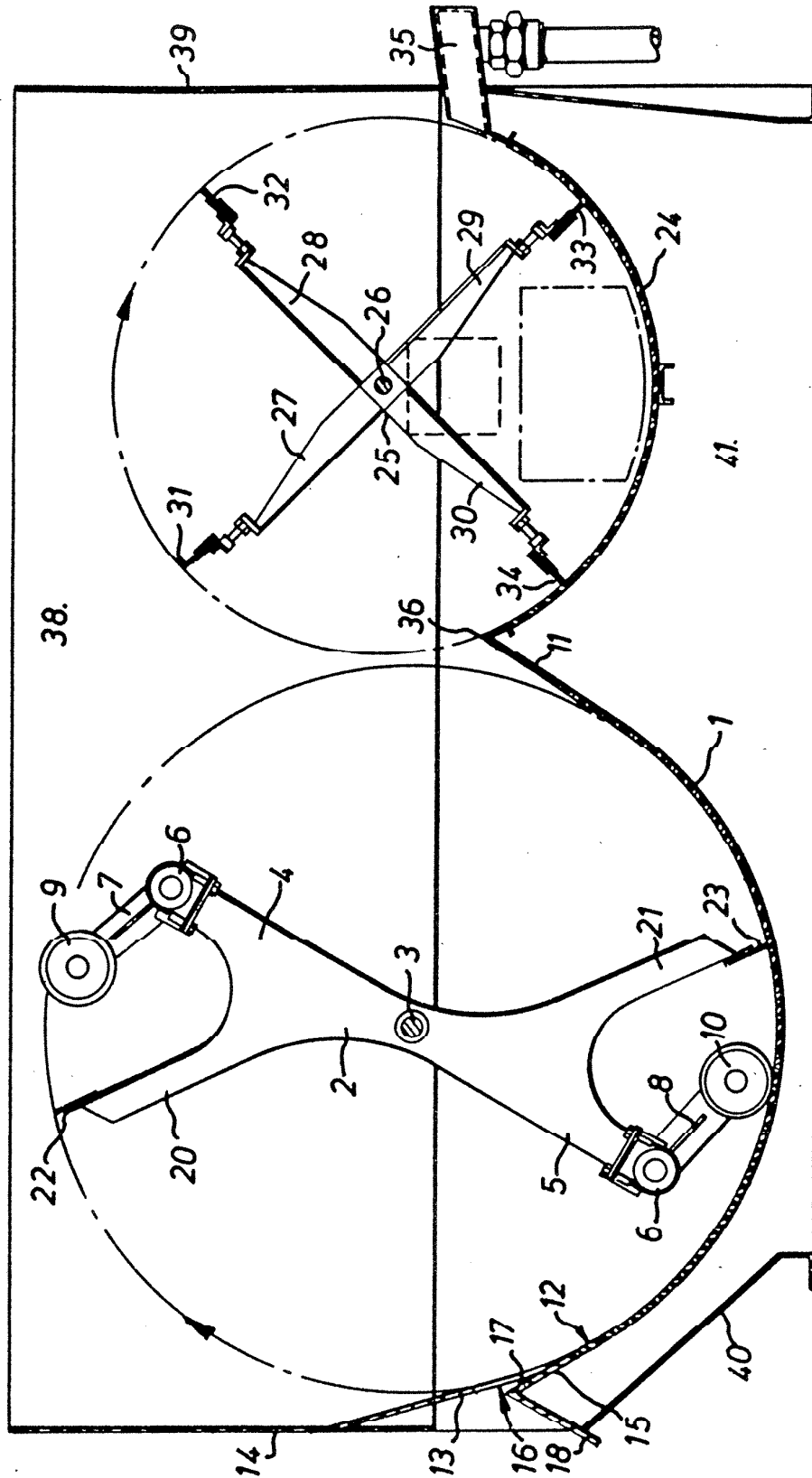
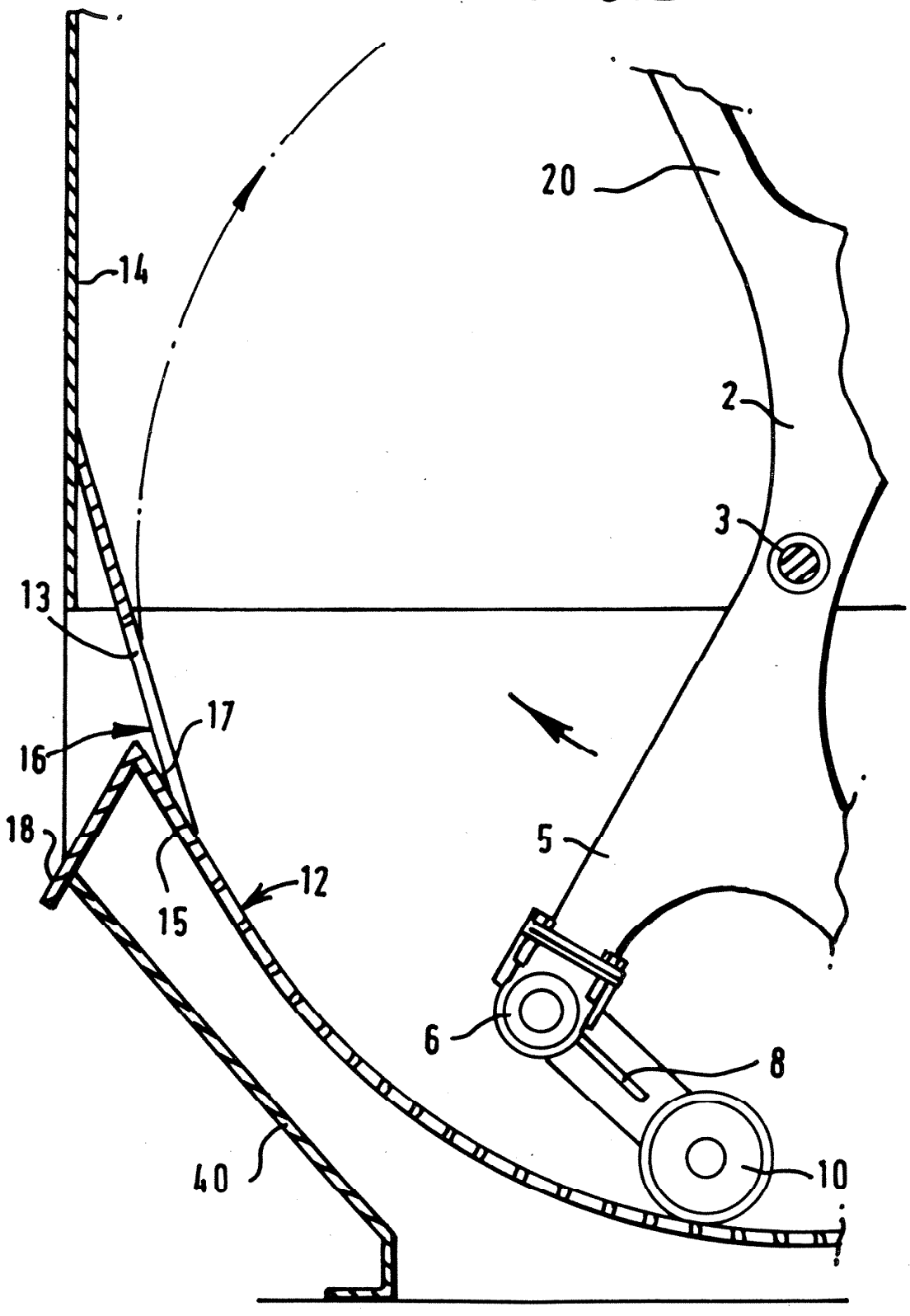


FIG. 2



**United States Patent No.7070707**

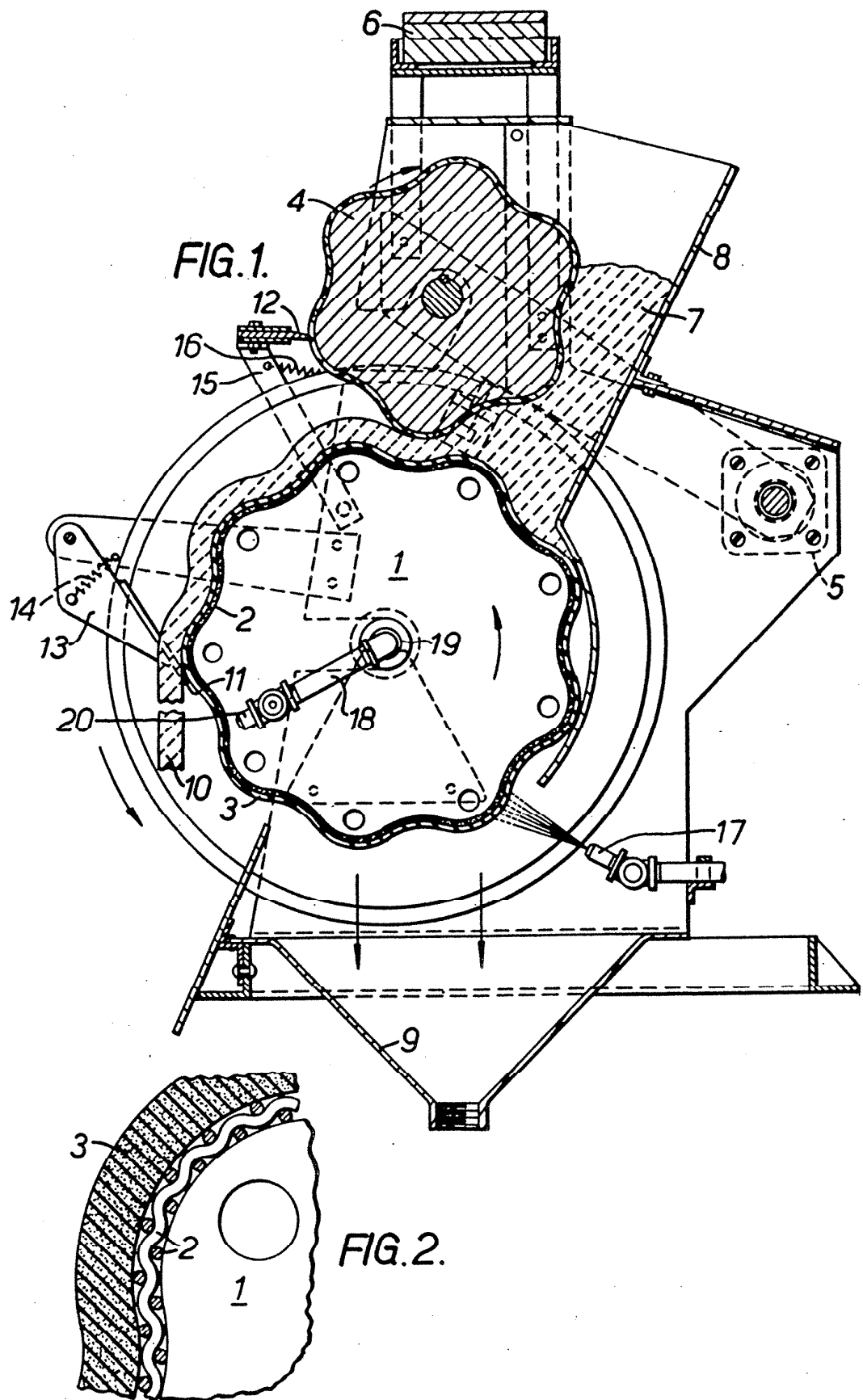
This invention relates to apparatus for dewatering sewage sludge. A disadvantage of such apparatus found in the art is that wire screens are easily damaged and costly to replace. To overcome this disadvantage it is proposed according to the present invention to cover the wire screen by or replace it with a pervious layer of resilient material by which liquid from the sludge can be absorbed and through which it can be expressed by the compression roller.

An embodiment of the invention is shown in the accompanying drawings wherein:  
Figure 1 is a vertical section through a compression filter: and  
Figure 2 is an enlarged detail view of a part of the drainage wheel of Fig. 1.

In the compression filter shown, a drainage wheel in the form of a fluted cylinder 1 is provided with a wire screen surface 2 covered with a two inch-thick layer 3 of foam rubber or foamed polyurethane. A fluted compression roller 4 having a surface which matches, and meshes with, the wheel surface 2 is disposed above the wheel on its ascending side. The wheel and roller are driven in opposite directions from a common motor (not shown). The compression roller 4 is rotatably mounted on pivoted arms 5 and exerts a pressure due to its own weight on the wheel. Alternatively this pressure may be increased by adding weights 6 to the arms 5 or spring-loading them.

Sludge 7 is fed through a hopper 8 to the ascending surface of the wheel below the roller and wheel to release its liquid content which is first absorbed by the layer 3 and then expressed therefrom by the pressure of the roller through the screen 2 to the interior of the wheel from the lower end of which it leaves through a drain 9. The dewatered filter cake 10 is scraped from the descending surface of the wheel by a scraper wire 11 mounted on pivoted brackets 13 and held in pressure engagement with the layer 3 by means of a spring 14. The scraper 11 may be replaced by any other suitable discharge means.

The surface of the roller 4 is cleaned by a blade 12 which is mounted on a pivoted frame 15 and held in pressure engagement with the surface of the roller by means of a spring 16. A suitable sprayhead 17 is positioned to direct a spray of liquid or an airblast onto the outer surface of the layer 3 for cleaning purposes. A washing liquid or air blast may also be directed onto the inner surface of the screen by a pipe 18 extending through a hollow trunnion 19 on one side of the drainage wheel and terminating in a spray head 20. This spray or air blast assists in stripping the filter cake 10 from the layer 3.





X-PRESS INC. PROUDLY PRESENTS THE

X-PRESS II

COMBINING ALL THE ADVANTAGES OF X-PRESS I WITH THE ADDITIONAL FEATURES OF :

- CONTINUOUS REMOVAL OF SOLIDS FROM THE ROLLERS
- EASY TO DISMANTLE FOR CLEANING AND MAINTENANCE
- NEW IMPROVED SOLIDS COLLECTION SYSTEM\* WHICH PREVENTS SOLIDS FALLING BACK ON TO THE DEWATERING SCREEN

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\* The rollers have scrapers set close to the roller periphery so as to continuously scrape off solid material which may collect on the roller. Scraped material simply drops back into the chamber to be picked up by brushes following closely behind the rollers and swept to the discharge edge and into the solids collection tank. After the roller has passed the discharge edge it runs up guide-rails and thereby continues to rotate so that the scraper scrapes off any solid material still attached to the roller and allows this material to drop clear of the discharge edge into the solids collection tank.

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SEE THE X-PRESS II IN OPERATION AT THIS YEAR'S ROYAL SHOW

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SEE OVERLEAF FOR FURTHER DETAILS

# X-PRESS II

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