United States Patent [19]

Brock

[11] **3,792,503**

[45] **Feb. 19, 1974**

[54] **PLASTIC SHEET CLEANING MACHINE**

[76] Inventor: **Gordon L. Brock,** 7652 Garfield Ave., Space No. 28, Huntington Beach, Calif. 92648

[22] Filed: **Oct. 26, 1971**

[21] Appl. No.: **192,396**

[52] **U.S. Cl.** **15/4,** 118/3

[51] **Int. Cl.** **A63d 5/00**

[58] **Field of Search** 15/4, 102, 100, 77; 118/3

[56] **References Cited**

UNITED STATES PATENTS

3,641,969	2/1972	Hakanson	118/3
3,060,477	10/1962	Wechsler	15/77
3,098,249	7/1963	Tice et al.	15/4
3,126,564	3/1964	Elliott	15/102
3,237,231	3/1966	Zink	15/102
3,328,821	7/1967	Mura	15/102
3,440,675	4/1969	Yeaman	15/4
3,630,776	12/1971	Barr	15/77
3,694,071	9/1972	Touchette	15/77 X
3,333,291	8/1967	Hondzinski	15/77 X

FOREIGN PATENTS OR APPLICATIONS

126,180	1/1932	Australia	15/77

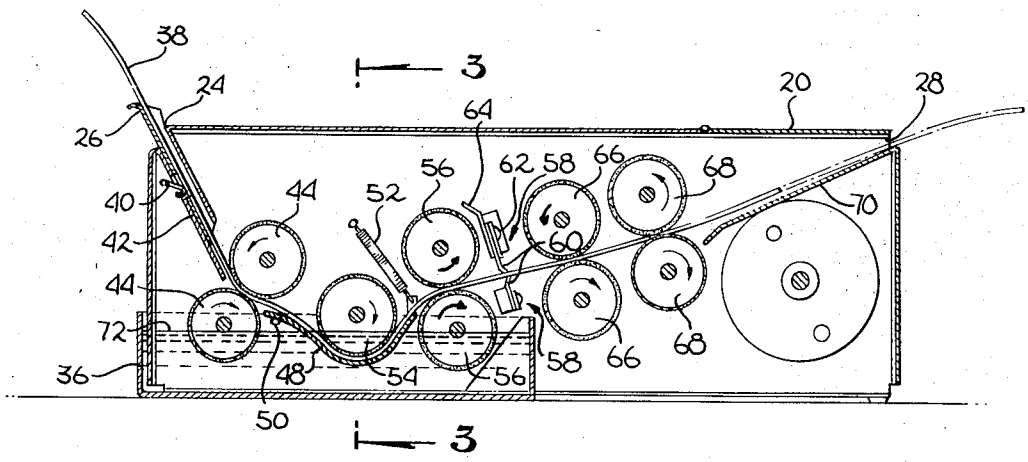
Primary Examiner—Leon G. Machlin

Attorney, Agent, or Firm—Spensley, Horn & Lubitz

[57] **ABSTRACT**

A plastic sheet cleaning machine for cleaning and drying plastic sheets, such as bowling score sheets. The machine has two pairs of rollers adapted to receive a plastic sheet and propel it past a counter-rotating cleaning roller disposed so as to be partially immersed in a cleaning fluid, a pair of oppositely disposed squeegee devices to remove the excess moisture from the sheet, and two pairs of soft absorbent rollers to further dry the cleaning sheet. A motor drive is adapted to be actuated by the insertion of a plastic sheet to be cleaned and a time delay mechanism is adapted to continue the operation of the mechanism until a plastic sheet passes completely therethrough.

8 Claims, 14 Drawing Figures



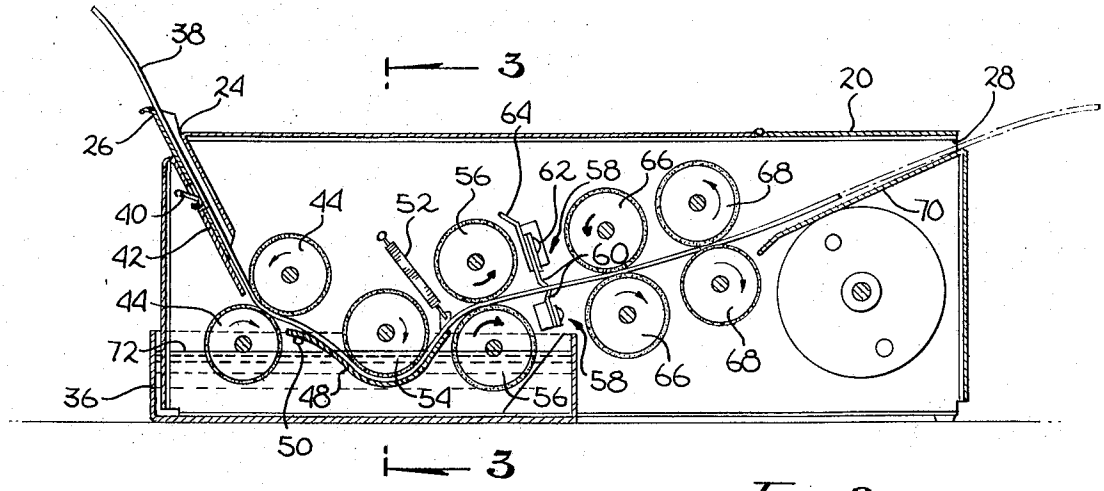


Fig. 2

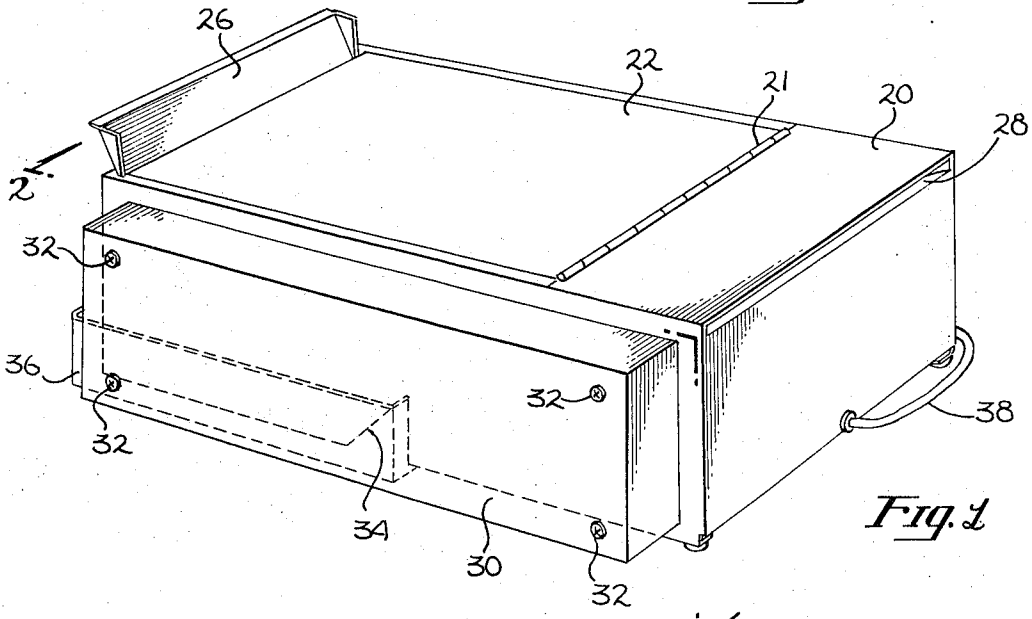


Fig. 1

21

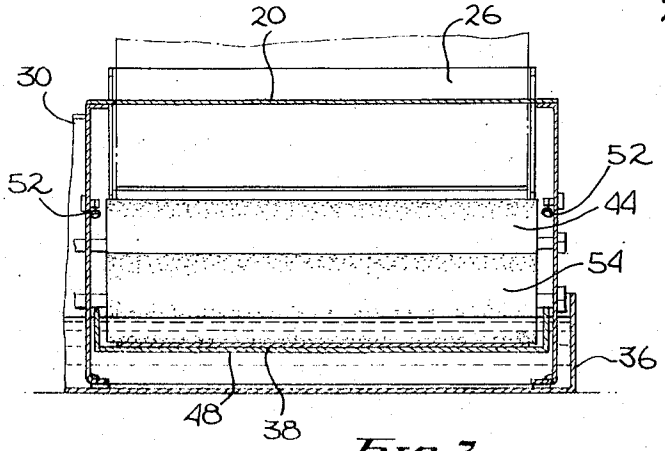
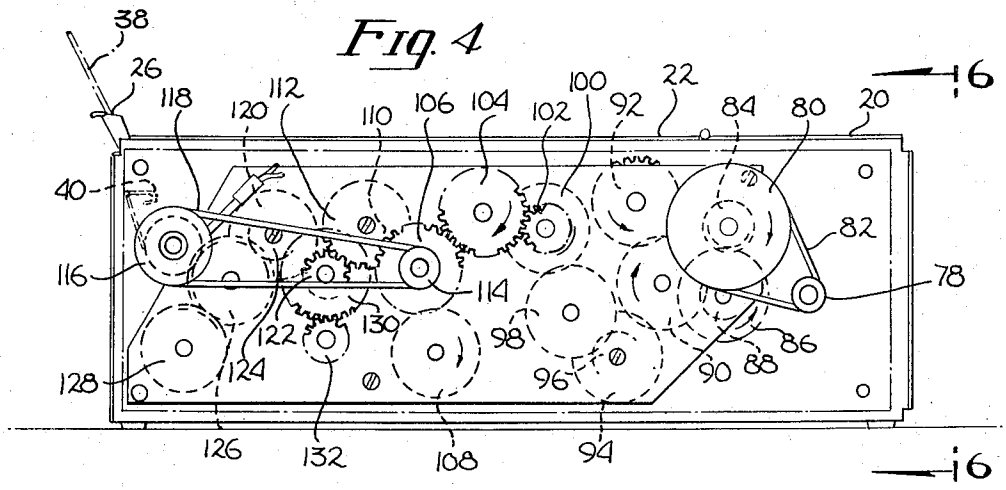


Fig. 3

GORDON L. BROCK
INVENTOR.

BY Spensley, Horn & Lubitz
ATTORNEYS

Fig. 4



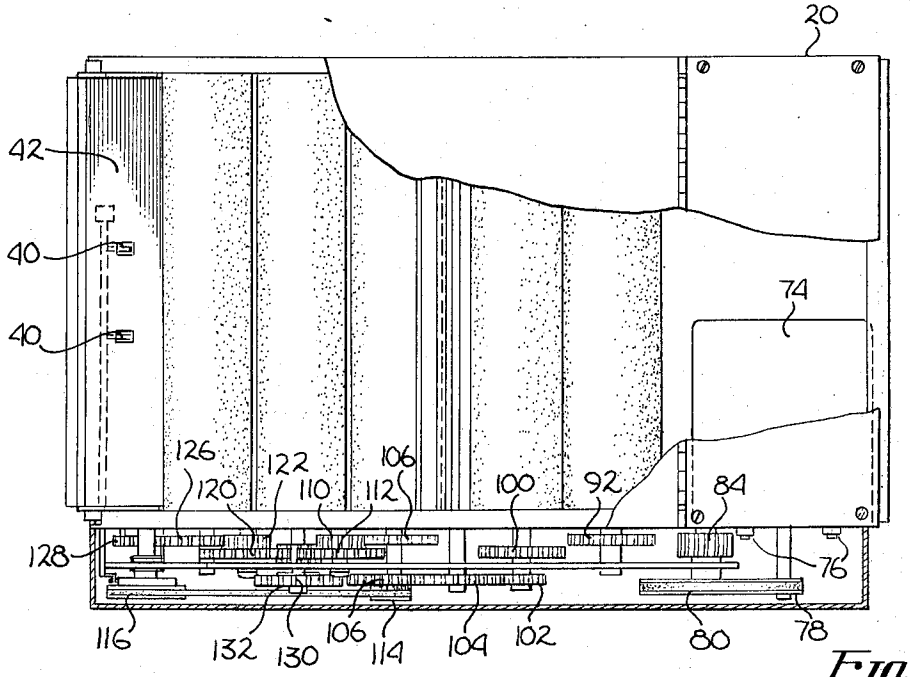


Fig. 5

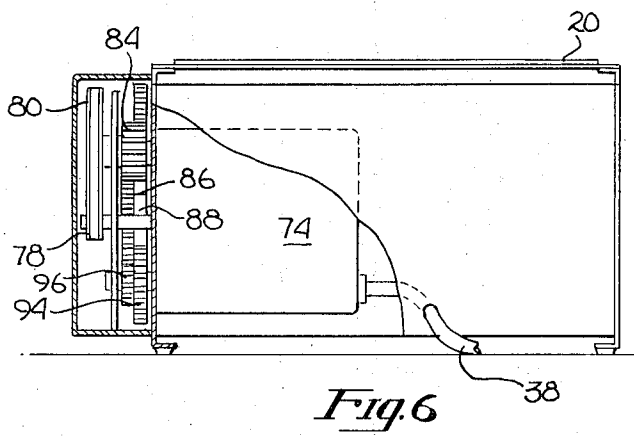


Fig. 6

GORDON L. BROCK
INVENTOR.

BY Spensley, Horn & Lubitz
ATTORNEYS

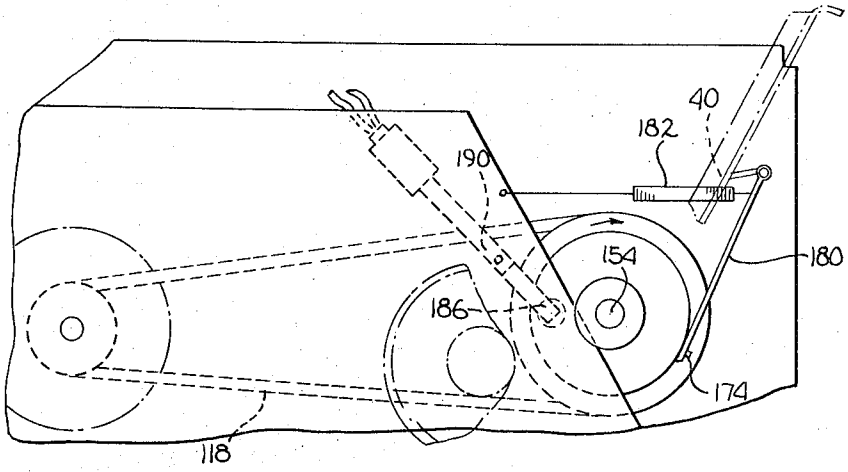


Fig. 7

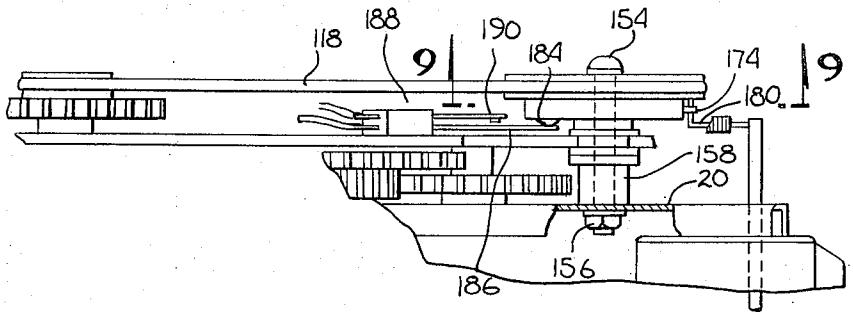
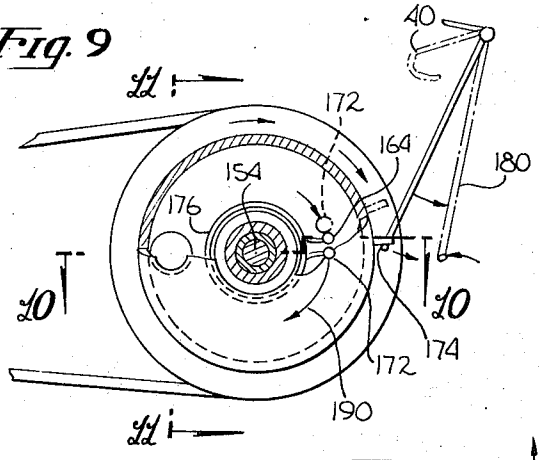


Fig. 8

Fig. 9



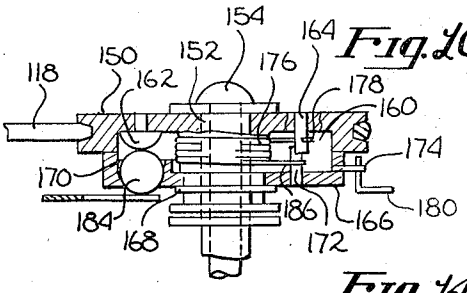


Fig. 10

Fig. 14

Fig. 13

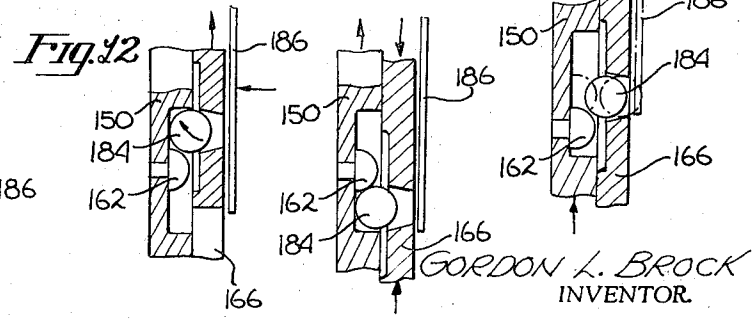


Fig. 12

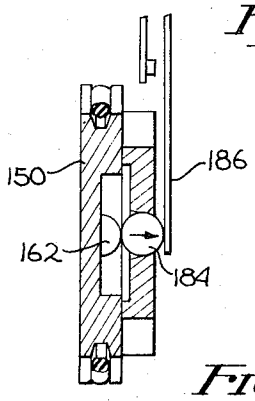


Fig. 11

GORDON L. BROCK
INVENTOR.

BY

Spensley, Horn, Jubas & Lubitz
ATTORNEYS

PLASTIC SHEET CLEANING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the field of automatic cleaning equipment, and particularly to automatic equipment for cleaning plastic sheet, such as is used for bowling score sheets and the like.

2. Prior Art

In certain applications, it is common to record information on a plastic sheet through the use of writing implements, such as are commonly known as grease pencils and the like, and to later clean the plastic sheet for reuse. By way of specific example, bowling score sheets are commonly in the form of clear plastic sheets having permanently printed thereon a pattern comprising a blank score sheet. During the game, the score is kept by appropriately marking the score sheet with a grease pencil, and the completed score sheet is later cleaned for reuse at a subsequent time. Since the specific embodiment of the present invention described in detail hereafter is for the automatic cleaning of such bowling score sheets, the discussion of the prior art hereinbelow presented shall be limited to the prior art method of cleaning such score sheets.

Plastic sheets, as hereinabove described, are often used as bowling score sheets in place of the older paper score sheets because of their ability to lie flat and not tend to curl around the edges, the ease with which marks may be made thereon with a grease pencil, and the ability of cleaning and reusing the score sheets. Also, a plastic sheet is not easily folded or hidden and, therefore, the number of score sheets may conveniently be used to determine the number of games bowled by the players. However, cleaning of the score sheets has heretofore been a difficult operation since liquid cleaners must generally be used to remove grease pencil marks and the sheets must be carefully dried before being stacked if they are not to stick together. Also, the sheets must generally be supported on a flat surface before being scrubbed in order to avoid tearing or permanently creasing the sheet.

In the prior art, the score sheets have generally been cleaned by hand. Thus, such sheet is placed on a flat surface, typically a table top, and the marked surface rubbed with a cloth generally dampened with a cleaning solution. Each sheet is then rubbed with a towel to remove the cleaning solution and the grease pencil material before the sheet dries. This is a time consuming and inconvenient operation requiring considerable space, and particularly space which may be splashed with cleaning solutions and the like during the operation. There is, therefore, a need for a device to automatically and quickly clean bowling score sheets which is self-contained, compact and self-actuating so that a score sheet once inserted is automatically cleaned and expelled therefrom in a matter of seconds.

BRIEF SUMMARY OF THE INVENTION

A plastic sheet cleaning machine for cleaning and drying plastic sheets, such as bowling score sheets. The machine comprises a first pair of rollers positioned to receive the plastic sheet therebetween and to guide the sheet past a cleaning roller disposed within the cleaning fluid and rotating in a direction opposite the movement of the sheet, a second pair of rollers disposed so as to guide the sheet away from the cleaning roller, a pair of oppositely disposed squeegee devices for removing the majority of the cleaning fluid from the plastic sheet, a third pair of rollers rotating faster than the first and second pairs of rollers to provide a drying action on the plastic sheet, and a fourth pair of rollers rotating faster than the third pair of rollers to further provide a drying action on the plastic sheet. A motor drive is adapted to be actuated by the insertion of a plastic sheet to be cleaned and a time delay mechanism is adapted to continue the operation of the mechanism until a plastic sheet passes completely therethrough.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the cleaning machine of the present invention.

FIG. 2 is a cross-section of the cleaning machine taken along lines 2—2 of FIG. 1.

FIG. 3 is a cross-section of the cleaning machine of FIG. 1 taken along lines 3—3 of FIG. 2.

FIG. 4 is a side view of the cleaning machine of FIG. 1 with cover 30 removed therefrom.

FIG. 5 is a top view, partially cut away, of the cleaning machine of FIG. 1.

FIG. 6 is an end view, partially cut away, of the cleaning machine of FIG. 1.

FIG. 7 is a side view of the machine illustrating the various parts comprising the time delay mechanism.

FIG. 8 is a top view of a portion of the cleaning machine of FIG. 1 shown in partial cross-section with cover 30 removed so as to further illustrate the components comprising the time delay mechanism.

FIG. 9 is a cross-section of the time delay mechanism taken along lines 9—9 of FIG. 8.

FIG. 10 is a further cross-section of the time delay mechanism taken along lines 10—10 of FIG. 9.

FIG. 11 is a cross-section of the time delay mechanism taken along lines 11—11 of FIG. 9.

FIG. 12 is a cross-section of the time delay mechanism similar to that of FIG. 11 illustrating the motion of the inner disc 166 with respect to disc 150 on insertion of a sheet to be cleaned.

FIG. 13 is a cross-section of the time delay mechanism similar to that of FIG. 11 further illustrating the motion of disc 150 and inner disc 166 during operation of the machine.

FIG. 14 is a cross-section of the time delay mechanism similar to that of FIG. 11 illustrating the manner in which the motion of disc 150 with respect to inner disc 166 causes the machine to actuate the on-off switch.

DETAILED DESCRIPTION OF THE INVENTION

First referring to FIG. 1, a perspective view of the preferred embodiment of the present invention may be seen. The machine is generally of a rectangular form having a cover 23 mounted on hinges 21, a slot 24 with a guide lip 26 adjacent thereto for receiving plastic sheet to be cleaned, and a slot 28 through which the cleaned sheet is expelled. A side cover 30 is attached to the main chassis by screws 32 to cover the gears and other mechanisms located thereunder. The side cover 30 is open at the bottom and the chassis 20 has slots 34 on each side thereof so that the machine may be placed over a pan 36 containing a suitable cleaning solution. A standard power cord 38 is provided for plugging into a standard 115 volt 60 cycle power supply.

Now referring to FIG. 2, a cross-section of the preferred embodiment taken along lines 2—2 of FIG. 1 may be seen. This cross-section shows the functional disposition of the plurality of rollers within the machine which are adapted to guide and propel the plastic sheet through the machine, to scrub the sheet and to dry the sheet. A plastic sheet, generally indicated by the numeral 38, is inserted through slot 24 in the chassis 20, being guided in the insertion by the lip 26. A pair of sensing arms 40 (FIGS. 2 and 5) are commonly pivotally supported so as to normally protrude through slots in the plastic sheet guide panel 42 and to be depressed by a plastic sheet inserted through slot 24 so as to actuate a switching mechanism. This starts a drive motor which, through a system of belts and gears to be subsequently described, drives the various rollers which guide, clean and dry the plastic sheet.

The first set of rollers to be engaged by the plastic sheet 38 is the pair of rollers 44. These rollers, like the other pairs of rollers in the device, are cylindrical members covered with rolled terry cloth material so as to have a somewhat compliant surface, and are disposed with a separation so as to grasp the plastic sheet 38 therebetween and to propel it onward through the cleaning machine. Thus, the rollers 44 grasp the plastic sheet 38, propelling it forward and slightly upward from its initial path through slot 24 toward the opening between upper guide 46 and the lower guide 48. The upper guide 46 is an integral member with a lower guide 48, and the entire assembly is pivoted about axis 50 with a coil spring 52 on each side of the device urging the lower guide member 48 upward against scrubbing roller 54.

The upper and lower guides 46 and 48 are disposed so as to guide the plastic sheet 38 toward scrubbing roller 54 in a substantially tangential manner. Thus, even though the scrubbing roller 54 is rotating in a direction so as to oppose the direction of travel of the plastic sheet 38, the plastic sheet will be fed under roller 54 between the roller and the lower guide member 48, rather than being deflected upward over the roller, as may be seen in FIG. 3.

As the front edge of the plastic sheet 38 progresses past scrubbing roller 54 and lower guide member 48, the plastic sheet engages rollers 56 which, like rollers 44, engage the plastic sheet therebetween and guide and propel the sheet onward through a pair of squeegees, generally indicated by the numeral 58. The squeegees are comprised of a pair of soft rubber strips 60 fastened by screws 62 to members 64, which are supported by the chassis 20. The soft rubber strips 60 deflect so as to allow the free passage of the plastic sheet therebetween but gently engage the surface of the sheet so as to remove excess moisture therefrom.

As the front edge of the plastic sheet 38 passes through the squeegees 58, it is engaged by a pair of rollers 66, then by a pair of rollers 68, and finally is guided by a guide member 70 so as to be expelled through slot 28 in the end of the cleaning device.

The pan 36 is partially filled with a cleaning solution, that is, a mixture of water and cleaner which will tend to dissolve the grease pencil marks on the plastic sheet. The level of the solution, generally indicated by the numeral 72, is such that a portion of the scrubbing roller 54 is immersed below the surface of the fluid so that the plastic sheet, as it passes between the roller 54 and the lower guide member 48, is scrubbed by the counter rotating dampened scrubbing roller 54.

Rollers 44 have a spacing so as to firmly engage plastic sheet 38 and to encourage it past the counter rotating scrubbing roller 54. Similarly, rollers 56, which are rotating in the same direction and with the same speed as rollers 44, firmly grasp the plastic sheet and propel it onward through the cleaning machine. Rollers 66 are disposed with the spacing slightly greater than that of rollers 56 so as to less firmly engage the plastic sheet, and rollers 68 similarly are still further spaced so as to still less firmly engage the plastic sheet.

In the preferred embodiment, rollers 44 and 56 propel the plastic sheet with a surface velocity of approximately 1½inches per second, with the scrubbing roller 54 being approximately the same diameter as rollers 44 and 56 and rotating in a direction opposing the motion of the plastic at eight times the angular velocity of those rollers. This provides sufficient scrubbing action to clean the upper surface of the plastic sheet without causing undue friction, wear, etc., on either the scrubbing roller or the surface of the plastic sheet. Rollers 66 rotate at twice the angular velocity of rollers 44 and 56 and rollers 68 rotate at four times the angular velocity of rollers 44 (twice the angular velocity of rollers 66). Thus, because of the spacing of the various rollers as hereinbefore described, while the plastic sheet is engaged between rollers 56, rollers 66 and 68 slide on the surface of the plastic sheet, thereby wiping therefrom substantially all moisture remaining thereon after passing through the squeegees 58. When the end of the plastic sheet passes beyond rollers 56, rollers 66 then determine the speed with which the plastic sheet is propelled, and rollers 68 continue the drying action. Finally, when the end of the plastic sheet passes beyond rollers 66, rollers 68 continue the drying action on the end of the plastic sheet by the rolling of the dry terry-cloth surfaces along the surface of the plastic sheet, and accelerate the plastic sheet so that its momentum will generally propel the plastic sheet entirely out through slot 28.

Thus, it may be seen that merely by the insertion of the end of a plastic sheet to be cleaned into slot 24 with the surface to be cleaned in a generally upward direction, the cleaning device is automatically turned on and the plastic sheet is automatically cleaned and dried. It is apparent that as the trailing edge of plastic sheet 38 passes by sensing arms 40, the sensing arms will return to the unactuated position and if such action were allowed to turn off the cleaning device, the plastic sheet would remain therein. Thus, a time delay mechanism is provided, which will be subsequently described in detail, to continue the operation of the cleaning device at least until the plastic sheet being cleaned is expelled therefrom.

Now referring to FIGS. 4, 5 and 6, details of the drive mechanism for the various rollers may be seen. FIG. 4 is a side view of the apparatus of FIG. 1 with the side cover 30 removed, FIG. 5 is a top view of the same apparatus, partially cut away, and FIG. 6 is an end view of the apparatus, partially cut away. A drive motor 74 is attached to chassis 20 by screws 76 and is adapted to drive pulley 78 in the direction indicated by the arrow thereon. The pulley 78 drives pulley 80 through belt 82, which in turn drives gear 84 integral with pulley 80. Gear 84 drives gear 86 which in turn drives smaller gear 88 integral therewith. Gear 88 drives gear 90

which in turn directly drives gear 92 and gear 94. Gears 90 and 92 are rigidly attached through rollers 68, thereby driving the rollers in the direction indicated in FIG. 2. Gear 96 is integral with gear 94 and drives gear 98, which in turn directly drives gear 100. Since gear 96 is one-half the diameter of gear 94, gears 98 and 100 and thus rollers 58 and 66 are driven at one-half the angular velocity of rollers 68, as hereinbefore described.

Integral with gear 100 is a second gear 102 one-half the diameter of gear 100, which drives gear 104. Gear 104 directly drives gear 106, which in turn drives gear 108 and gear 110 integral with a larger gear 112. Also integral with gear 106 is a pulley 114 which drives a time delay mechanism, generally indicated by the numeral 116, through a belt 118. Since the drive gear 102 is one-half the diameter of gear 104, the angular velocity of gears 106 and 108, which drive rollers 56, is one-half the angular velocity of the gears 198 driving rollers 66. However, since gear 110 is one-half the diameter of gear 112, gear 112 rotates at twice the angular velocity of rollers 56 and drives gear 130 through gear 122, also at twice the angular velocity of rollers 56. Gear 120 has integral therewith a gear 124 having a diameter equal to one-half the diameter of gear 120 which drives gear 126 at the same angular velocity as rollers 56, and which in turn drives gear 128 at the same angular velocity as gear 122. Gears 126 and 128 drive rollers 44 and thus rollers 44 and 56 are driven at the same angular velocity, that is, an angular velocity which is one-half the angular velocity of rollers 66.

Gear 112 is driven at twice the angular velocity of rollers 44 and 56 and in turn drives gear 122 at four times the angular velocity of these rollers. Integral with gear 122 is a gear 130 twice its diameter which drives gear 132 (the same size as gear 122) at twice its angular velocity, that is, at eight times the angular velocity of rollers 44 and 56. Integral with gear 132 is the scrubbing roller 54.

The direction of rotation of the various gears, and thus of the various rollers, is indicated by the arrows in FIG. 4 and, as may readily be seen, is consistent with the direction of rotation of the various rollers shown in FIG. 2. The various shafts supporting the gears are in turn supported by bushings at each side of the chassis 20 and/or by bushings supported by plate 134 spaced away from the side of the chassis and supported therefrom by a plurality of standoffs.

Now referring to FIGS. 7–12, details of the time delay mechanism which maintains electrical power to motor 74 for a sufficient length of time to fully expel a clean plastic sheet may be seen. The components of the time delay mechanism are best seen in FIGS. 8 and 10. Belt 118 is adapted to drive disc 150 in the direction indicated in FIG. 7. The disc 150 has an inner diameter forming a slip fit on bushing 152 which is supported from the side of chassis 20 by a screw 154 and nut 156, and is spaced outward from the chassis 20 by a spacer 158. The disc 150 is characterized by a V-groove on its outer periphery for receiving belt 118 and a cylindrical undercut region 160 on the inward facing surface of the disc. A spherically headed member 162 is disposed in a mating hole in the side of disc 150 and a pin 164 is disposed in a similar hole in the disc approximately diametrically opposite the spherically headed member 162, but located closer to the axis of the disc. An inner disc 166 is also supported by bushing 152 and is retained adjacent disc 150 by a snap ring 168.

The inner disc is characterized by a tapered hole 170 at a matching radius with the spherically headed member 162 and a pin 172 at a matching radius with pin 164. Also projecting outward from the periphery of inner disc 166 is a second pin 174 and located between the inner disc 166 and disc 150 is a coil spring 176 having the ends 178 and 180 looped around pins 164 and 172 respectively. Thus, the coil spring 176 is adapted to apply a torque between the inner disc 166 and disc 150 if properly preloaded.

When the cleaning machine is off sensing arms 40 will be extending outward through the slots in guide member 42 and arm 180 will engage pin 174 on inner disc 166, arm 180 and arms 40 being urged to this position by coil spring 182. In this position, spherical member 162 engages ball 184 in the tapered hole 170 and forces it outward to an extended position so as to engage leaf 186 (FIG. 8) of the switch assembly 188 and deflect it away from fixed contact 190 so as to break the electrical circuit to the motor 74. (The tapered hole 170 has an outer diameter slightly less than the diameter of ball 184 so that in no event may ball 184 fall out of the inner disc 166, and in fact ball 184 is at all times retained generally within the tapered hole 170, though not always extended as shown in FIGS. 8 and 10.) At this time, inner disc 166 is restricted in rotation by arm 180 as previously described and pins 164 and 172 are so disposed as to engage each other, or be about to engage each other, so that disc 150 may not rotate beyond the position where spherically headed member 162 forces ball 184 outward to open the switch contacts.

When a plastic sheet is inserted into slot 24 and engages arms 40, arm 180 is deflected away from pin 174 as indicated in phantom in FIG. 9. At this time, coil spring 176, which has been provided with a suitable preload, rotates the inner disc 166 in the direction indicated by the arrow 190 in FIG. 9, so that pin 172 moves from a position immediately below pin 164, as shown in FIG. 9, to a position immediately above pin 164. Of course, the ball 184 undergoes a similar movement and since the rotation of the inner disc 166 is slightly less than one full turn, the ball no longer is aligned with switch member 186 or with the spherically headed member 162. This is illustrated in FIGS. 11, 12 and 13. In FIG. 11, which is a cross-section taken along lines 11—11 of FIG. 9, the mechanism is shown in the off position. When arm 180 is deflected away from pin 174, the inner disc 166 rotates with respect to disc 150 in the direction generally indicated by the arrow 200 as a result of the preload in spring 176 (FIG. 10). The initial motion of inner disc 166 causes the ball 184 to move off member 162, thereby allowing leaf 186 to fall back and make contact with fixed contact 190. This turns on motor 74 and as a result disc 150 also starts rotating. Inner disc 166 is quickly rotated through nearly one whole turn to the position shown in FIG. 13, further rotation between disc 150 and inner disc 166 being prevented by the engagement of pins 164 and 172 (FIG. 9).

As long as the plastic sheet is engaging arms 40 so as to deflect arm 180 outward from the normal position of pin 174, disc 150 and inner disc 166 will rotate in unison with the relative orientation shown in FIG. 13. Thus, though the ball 184 will periodically pass leaf

186, the ball will not be extended and, therefore, leaf 186 will not be deflected so as to open the switch. When the end of the plastic sheet passes arms 40, arm 180 will be allowed to resume the position shown in FIGS. 9 and 10. Thus, arm 180 will catch pin 174 as inner disc 166 rotates so as to stop the inner disc in the position shown in FIG. 14, that is, to stop the inner disc with the ball 184 aligned with the leaf 186. The motor will continue to run, however, until disc 150 has been rotated nearly one full turn with respect to the stopped inner disc 166, that is, until disc 150 rotates to a position so that spherically headed member 162 may force ball 184 outward to deflect leaf 186 away from the stationary contact 190 of the switch, thus turning off motor 74, and pins 164 and 172 are again adjacent each other. Consequently, it may be seen that in the event arm 180 engages pin 174 immediately after the end of the plastic sheet passes arms 40, the machine will continue to run until disc 150 has been rotated nearly one full turn with respect to inner disc 166. The gear ratios and pulley diameters are selected so that the length of time required for such rotation of the disc 150 with respect to the inner disc 166 is at least sufficient for the end of the plastic sheet to pass completely through the cleaning machine and the plastic sheet to be expelled therefrom. In general, pin 174 will not be aligned with arm 180 when the end of the plastic sheet passes arms 40 and consequently the cleaning machine will be allowed to operate for a few seconds longer, that is, for an increased length of time determined by the time required for inner disc 166 to rotate to a position for pin 174 to engage arm 180. Electrical insulation for the various members comprising the switch and the time delay mechanism is provided by mounting the switch contacts on insulative members and by using plastic members for disc 150 and inner disc 166.

It should be noted that other mechanisms may also be used to assure operation of the cleaning machine for a sufficient length of time for the clean plastic sheet to be expelled therefrom. By way of example, electronic time delay circuits might be used in conjunction with a relay or electronic switch in series with the electrical connection for the motor. Similarly, a switch might be located so as to sense the presence of the plastic sheet at or near the exit of the cleaning machine and be connected in circuit with a switch actuated by arms 40 so that the motor 74 would operate when either switch was actuated. Such a disposition of switches would assure continued operation of the machine for a sufficient length of time for the cleaned plastic sheet to be expelled therefrom, provided the plastic sheet were of sufficient length so that the plastic sheet spanned the distance through the cleaning machine between the two switches. It has been found, however, that the mechanism described in detail hereabove is a simple and reliable mechanism to achieve the above stated objects and is therefore used in the preferred embodiment.

The net result of the invented plastic sheet cleaning machine as used for cleaning bowling score sheets is a simple, reliable machine for quickly and easily cleaning bowling sheets on either a one at a time basis or in substantial quantities. The machine of the preferred embodiment is approximately 13 inches wide by 20 inches long, with a height of approximately 8 inches. Thus, the machine requires very little space and is always in a ready condition for operation, provided cleaning solution is maintained in the machine. Since most of the cleaning solution is removed from the sheet before it passes to the drying portion of the machine, the rate of usage of cleaning solution is very low and many sheets may be cleaned by the machine before the solution needs to be replenished or replaced.

It should be noted that while the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in forms and details may be made therein without departing from the spirit and scope of the invention.

I claim:

1. A plastic sheet cleaning apparatus comprised of:
means for receiving a plastic sheet;
drive means;
means for starting said drive means upon insertion of the end of a plastic sheet into said means for receiving a plastic sheet;
a first pair of rollers driven by said drive means and disposed and rotated in opposite directions so as to grasp said plastic sheet therebetween and propel it onward through said machine;
a scrubbing roller driven by said drive means;
means for retaining a cleaning solution so that said scrubbing roller is moistened thereby;
guide means for receiving said plastic sheet from said first pair of rollers and directing it toward said scrubbing roller in a generally tangential direction, said guide means having one surface extending past said scrubbing roller so as to direct the passage of said plastic sheet therebetween, said surface of said guide means and the surface of said roller being yieldably urged toward each other;
a second pair of rollers driven by said drive means and disposed and rotated in opposite directions at the same speed as said first pair of rollers so as to grasp said plastic sheet therebetween as it moves past said scrubbing roller and to propel said plastic sheet onward;
a squeegee means disposed to receive said plastic sheet from said second pair of rollers, said squeegee means having a flexible member disposed toward each surface of a plastic sheet passing therebetween and operative to remove excess moisture therefrom;
a third pair of rollers having soft, absorbent surfaces driven by said drive means and disposed and rotated in the same direction as said first and second pairs of rollers so as to receive said plastic sheet from said squeegee means and operative to dry said plastic sheet;
a fourth pair of rollers having soft absorbent surfaces driven by said drive means and disposed and rotated in the same direction as said first, second and third rollers so as to receive said plastic sheet from said third pair of rollers and operative to further dry said plastic sheet, said third and fourth pair of rollers further being operative to encourage said plastic sheet onward through said apparatus; and
means coupled to said drive means operative to continue operation of said drive means after the end of said plastic sheet has passed said means for starting said drive means for a length of time at least sufficient for said plastic sheet to pass said fourth pair of rollers.

2. The plastic sheet cleaning apparatus of claim 1 wherein the axis of each of said rollers is substantially

horizontal and said means for retaining a cleaning solution comprises a pan disposable so that said scrubbing roller may be partially immersed in a cleaning solution in said pan.

3. The apparatus of claim **2** wherein said scrubbing roller is driven in rotation in a direction so as to oppose the normal direction of the motion of said plastic sheet through said apparatus.

4. The apparatus of claim **3** wherein said third and fourth pairs of rollers are driven at a higher angular velocity than said first and second pairs of rollers.

5. The apparatus of claim **4** wherein all of said rollers are approximately the same size, said first and second pairs of rollers are adapted to propel said plastic sheet through said apparatus at approximately 1½ inches per second, said scrubbing roller is driven at approximately eight times the angular velocity of said first and second pairs of rollers, said fourth pair of rollers is driven at approximately twice the angular velocity of said third pair of rollers, and said third pair of rollers is driven at approximately twice the angular velocity of said first and second pair of rollers.

6. The apparatus of claim **1** wherein said drive means comprises an electric motor, said means for starting said drive means is a mechanical means for sensing insertion of the end of a plastic sheet into said means for receiving the end of a plastic sheet and is coupled to a switch, and said means coupled to said drive means operative to continue operation of said drive means is a mechanical means operative to delay the turning off of said switch.

7. The apparatus of claim **6** wherein said mechanical means for sensing insertion of the end of a plastic sheet and said mechanical means operative to delay the turning off of said switch comprises:

first and second switch members disposed on the frame of said apparatus and connected in series with said motor so as to operate said motor when said first and second switch members are in contact, said first and second switch members being elastically urged into contact;

a first member adapted to be driven in rotation about an axis in a first angular direction by said drive means;

a second member adjacent to and adapted for rotation about the same axis as said first member, said second member being elastically encouraged in rotation in said first angular direction with respect to said second member, angular rotation of said first and second members with respect to each other being limited to less than one full turn by the interference of members on said first and second members;

a sensing member extending to said means for receiving the end of a plastic sheet and operative to stop said second member when said second member reaches a first angular position and when said sensing member is not sensing the presence of a plastic sheet; and

a switch actuating member mounted on said second member and adapted for motion generally parallel to the axis of said second member, said switch actuating member being disposed adjacent said first switch member when said second member is in said first angular position, said first member being adapted to force said switch actuating member outward to deflect said first switch member away from contact with said second switch member as said first member approaches the end of its angular freedom in siad first angular direction with respect to said second member.

8. The apparatus of claim **7** wherein said switch actuating member is a ball.

* * * * *