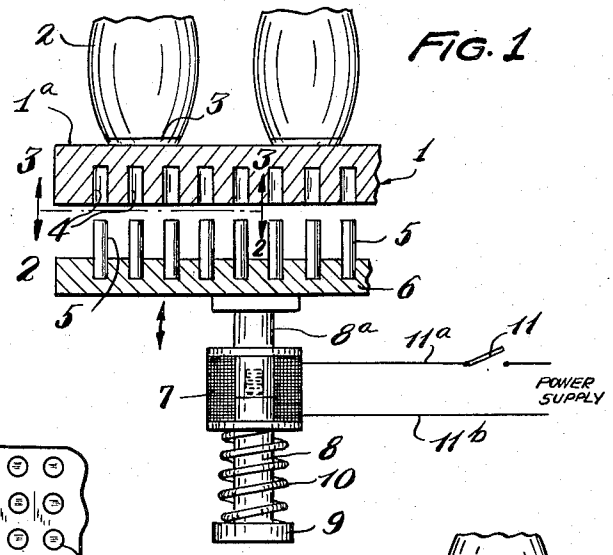
Aug. 19, 1958 H. S. JOHNS ET AL 2,848,235

MOVABLE MAGNETIC BOWLING PIN HOLDING APPARATUS

Filed Sept. 8, 1953 2 Sheets-Sheet 1

FIG. 1



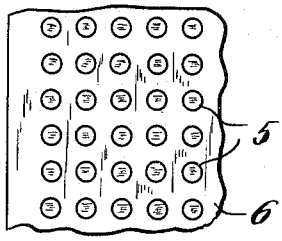


FIG. 2

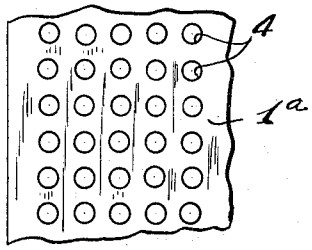


FIG. 3

FIG. 4

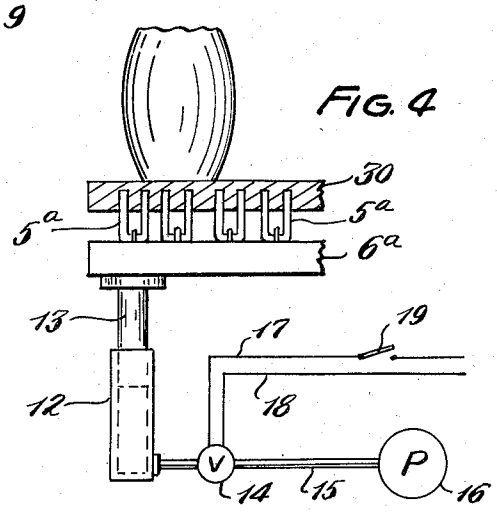


FIG. 5

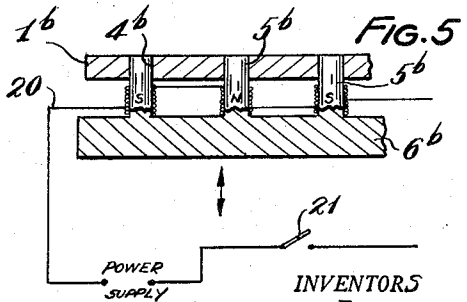
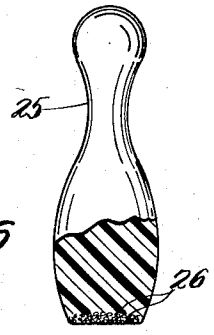


FIG. 6



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Aug. 19, 1958 H. S. JOHNS ET AL 2,848,235

MOVABLE MAGNETIC BOWLING PIN HOLDING APPARATUS

Filed Sept. 8, 1953 2 Sheets-Sheet 2

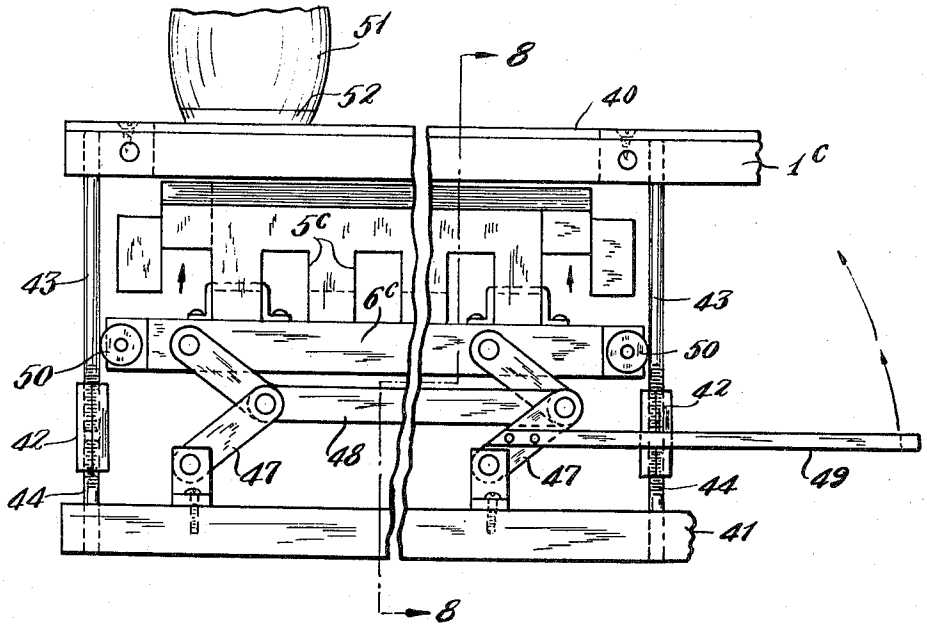


FIG. 7

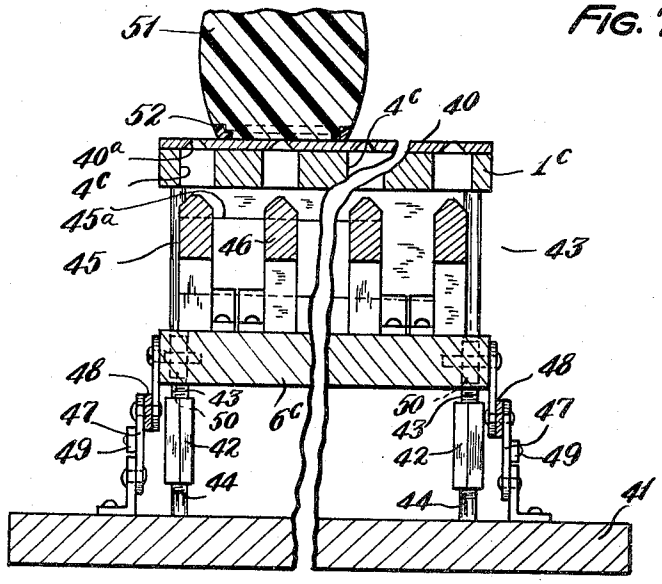


FIG 8

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MOVABLE MAGNETIC BOWLING PIN HOLDING APPARATUS

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Application September 8, 1953, Serial No. 378,812

3 Claims. (Cl. 273—54)

This invention relates to bowling and bowling alleys, and especially to movable magnetic apparatus for retaining bowling pins in fixed position.

Heretofore various efforts have been made to provide automatic pin setting apparatus for use in bowling alleys. Such automatic pin spotters or setters comprise various means for removing fallen or knocked over pins from the bowling alley, lifting such fallen pins into some type of a pin distributing and placing apparatus and placing the pins on the so-called pin spots of the bowling alley to provide ten properly located pins for use in starting a bowling frame. After one ball has been thrown, however, and some pins have been knocked over it has been somewhat difficult to retain the then standing pins in proper position while the fallen or dead wood pins are removed from the alley. Some apparatus provided heretofore has even removed the standing pins after one ball was thrown, removed the fallen pins, and replaced the standing pins for the second ball to be thrown in any given bowling frame. The types of apparatus provided heretofore have been relatively heavy and complex, or the apparatus has been quite expensive. In some instances, the automatic pin setting apparatus has required a large number, such as 21, of pins per alley so that the bowlers using the same alley do not throw at exactly the same ten pins and this may give one bowler an advantage over another.

One further objection to various types of pin setting apparatus such as has been developed heretofore is that the apparatus may not function to hold pins in their then positions if the pins are off the actual pin spot position, or which may not remove such pins, or re-position such pins properly if they are moved in between the first and second ball of the bowling frame. Furthermore, the apparatus may not function to pick up such off center spot pins at the end of the bowling frame prior to the commencement of the next frame.

The present invention relates to the use of magnetizable bowling pins in combination with magnet means so that the pins can be retained in a fixed position while the fallen pins are swept from or otherwise removed from the alley, preparatory to the throwing of a second ball in any given bowling frame. Reference is made to our copending application Serial Number 150,361 filed March 18, 1950, since matured into Patent No. 2,652,253 which shows one type of magnetizable means which we have developed heretofore.

The general object of the present invention is to avoid and overcome the foregoing and other difficulties with and disadvantages of previous types of automatic pin spotting apparatus and to provide mechanical pin spotting and setting apparatus characterized by the use of magnet means for retaining the bowling pins in any then occupied position when removing the fallen pins from the alley.

Another object of the invention is to provide a plurality of magnet means for engaging magnetically any one pin

in the pin receiving area of a bowling alley to hold it in position while fallen pins are removed.

A further object of the invention is to provide a plurality of small movably positioned magnets in association with the lower surface of a fixedly positioned bowling alley.

Yet another object of the invention is to provide a plurality of magnets on a common positioning member with such positioning member serving to move the magnets up into recessed areas provided in a lower surface of the bowling alley when the magnet means are to be operatively positioned, and to move such magnet and carrier means to a spaced or retracted relationship with the lower surface of a bowling alley when the magnet means are non-operatively positioned.

A further object of the invention is to position a plurality of elongate magnets in association with the lower surface of the bowling pin receiving area of a bowling alley for retaining bowling pins in set positions and wherein immediately adjacent magnet ends are of opposite polarity.

Another object of the invention is to use permanent magnets for retaining bowling pins in fixed positions on a bowling alley and to move the permanent magnets into and from association with the alley for operative or inoperatice positioning thereof.

The foregoing and other objects and advantages of the invention will be made more apparent as the specification proceeds.

For a better understanding of the invention, reference should be had to the accompanying drawings wherein several currently preferred embodiments of the invention are shown and wherein:

Fig. 1 is a fragmentary vertical section of a bowling alley with magnet means embodying the principles of the invention shown operatively associated therewith;

Figs. 2 and 3 are fragmentary horizontal sections looking in the directions indicated and taken on lines 2—2 and 3—3 respectively of Fig. 1;

Fig. 4 is a fragmentary vertical section of a modification of the apparatus of Fig. 1;

Fig. 5 is a fragmentary vertical section of another modification of the apparatus of the invention;

Fig. 6 is an elevation, partially broken away and shown in section of a novel bowling pin of the invention;

Fig 7 shows a side elevation of a further modification of the invention; and

Fig. 8 is a transverse vertical cross-section taken on line 8—8 of Fig. 7.

The invention relates to a bowling alley which has continuous fixed floor means in the bowling and pin receiving areas thereof, and magnet means are provided and means movably position the magnet means below the pin receiving area of the bowling alley for movement towards and from close association with the upper or pin receiving surface of the pin receiving area of the bowling alley.

Reference now is directed to the details of the structure shown in the drawings and a bowling alley is indicated as a whole by the numeral 1. While only a small area of the bowling alley 1 is shown, this alley is of conventional construction and usually would be made from overlapped wood strips interlocked as is customary in the building of bowling alleys. The invention is particularly concerned with the construction of the bowling alley in the pin receiving area thereof, and substantially conventional bowling pins 2 are shown positioned on the pin receiving area 1a of the bowling alley 1. The pins 2 are, for example, provided with metal base plates 3, which pins 2 may be of the construction shown in our U. S. Patent 2,591,265.

As an important feature of the present invention, the bowling alley **1** is provided with a plurality of recesses **4** usually in the form of holes which extend up into the alley **1** from the lower surface thereof, as shown in Fig. 1, to terminate close to the upper surface of the alley. These recesses **4** are of any desired cross-sectional contour and are usually positioned in closely spaced relationship with two or three recesses being immediately adjacent the base of each of the pins carried by the alley.

To retain the pins **2** in given positions, a plurality of relatively elongate permanent magnets **5** are positioned below the surface of the alley **1** with such magnets **5** being so spaced and shaped as to be engageable as a unit with the recesses **4**. The magnets **5** are carried by positioning or carrier plates **6**.

In order to move the permanent magnets **5** into and from immediate association with the alley **1** for retaining the pins in given positions, the carrier plate **6** is movably positioned by means such as solenoids **7**, a plurality of which may be associated with the carrier plate and with a solenoid core **8** being slidably positioned in each solenoid. These solenoids **7** are suitably fixably positioned and the cores **8** are suitably secured to non-magnetic connector bars **8***a* that are secured to the carrier plate **6**. Thus energization of the solenoids **7** will move the carrier plate **6** and the magnets **5** up into immediately adjacent relationship with the alley **1** with the magnets **5** extending into the recesses **4** to points adjacent the upper surface of the alley **1**. It will be noted that the recesses **4** do not extend completely through the alley **1** but that such recesses can be provided to extend to any desired spaced relationship with the upper surface of the alley **1**. Thus a continuous unbroken upper surface is provided on the alley for bowling purposes, but the desired magnetizable force can be provided immediately below pins **2** carried by the alley **1** to retain such pins in a fixed position while the fallen pins are removed. Usually the lower ends of the solenoid cores **8** may have end discs or plates **9** provided thereon or secured thereto which plates **9** engage a spring **10** in telescoped engagement with the solenoid core **8** and positioned intermediate the solenoid **7** and the end plate **9**, so that such springs will aid gravity in returning the carrier plate **6** and associated means to the non-operative position, indicated in Fig. 1.

In some instances only one solenoid **7** may be provided for moving the carrier plate **6** and associated magnet means into operative position, whereas any number of solenoids may be provided, as desired to move the magnet means.

The solenoids **7** can be energized through any suitable means, and a control switch **11** is shown in the power supply leads **11***a* and **11***b* provided for the solenoid **7**. These leads connect to a suitable power source.

Fig. 5 of the drawings shows that the adjacent upper ends of the different magnets are preferably of opposite polarity which is thought to facilitate strong magnetic engagement between the magnets and any pins on the alley.

Fig. 4 shows a bowling alley **30** of substantially conventional construction, and with a carrier plate **6***a* being provided with a plurality of U-shaped permanent magnets **5***a* that are adapted to extend up into recesses provided in the lower surface of the alley **30** so that such magnets **5***a* terminate immediately adjacent the upper surface of the bowling alley. In this instance, some type of a pneumatically controlled plunger or cylinder **12** is provided to position the carrier plate **6***a* and the cylinder **12** has a piston **13** positioned therein. A control valve **14** is provided in an air pressure supply line or conduit **15** that in turn connects the cylinder **12** to a suitable source of air pressure **16**. Electric power supply lines **17** and **18** connect to the valve **14** and actuation of a switch or key **19** in the line **17** can be used to change the position

of the valve **14**. Usually this valve **14** is of such a nature that in one position it permits passage of air pressure from the pressure supply **16** to the cylinder **12** to move the piston **13** up, and in another position, the valve **14** exhausts air from the cylinder **12**.

It will be realized that the magnets **5***a* shown in Fig. 4 may be of any desired size so that a plurality of poles of the magnets are associated with the base of any pin carried by the alley **1***a*, and that both poles of and the entire magnet may be positioned in one of the holes or recesses in the alley **30**. It also should be understood that a plurality of the cylinders **12** would be provided usually for supporting the carrier plate **6***a* at spaced portions thereof and with the valve **14** either controlling flow of air to all of such cylinders **12** or with similar control valves being provided for the different cylinders and being controlled as a unit by the key or switch **19** or similar control member which would be positioned for convenient operation by the bowler or a pin boy.

Fig. 5 shows yet a slightly different type of magnet means of the invention wherein in this instance a bowling alley **1***b* has a plurality of recesses or holes **4***b* provided therein and usually extending through the entire thickness of the alley **1***b*. A plurality of magnets, or pole pieces **5***b* extend from a magnet plate **6***b* with convolutions of a wire **20** being provided around each of the projecting poles or magnets of the magnet plate. Thus on closing a switch **21** provided in the power supply line for the coils **20**, the coils can be energized for the desired magnetic holding action. The magnet plate **6***b* can be positioned in any desired manner and when in operative relationship to the alley and pins on the alley **1***b*, the ends of the pole pieces **5** would be flush with the top surface of the alley **1***b* so as to avoid any possible effect on the action of the bowling ball in rolling over the surface of the alley **1***b*. The magnet plate **6***b* normally would be fixed in the position shown but if the holes **4***b* were quite small in diameter, the pole pieces **5***b* might be withdrawn when *a* bowling ball were to be thrown.

Fig. 6 shows a bowling pin **25**, which is indicated as being made from plastic material, normally being made by a molding operation. The pin **25**, as a feature of the invention, has a plurality of magnetizable means, usually metal particles **26** embedded in and substantially uniformly distributed through the base area of the pin **25**, as indicated. This pin could be made from any conventional type of plastic material, with one suitable plastic being phenol-formaldehyde resin, or urea-formaldehyde resin. Possibly the pins could be molded by an injection molding operation wherein conventional plastic material would be inserted into the mold at one end thereof, and the plastic material having metal particles or similar means therein would be injected into the mold from an opposite end portion of the mold.

While movement of the magnet from a point below the bowling alley up into association with the bowling alley is shown in this invention, it will be appreciated that in some instances lateral movement of these magnet means may be desired. Furthermore, the invention contemplates the movement of magnetizing means, such as are disclosed in and covered by our co-pending application referred to hereinabove.

In any form of apparatus shown, permanent magnets, or electromagnets may be used, as desired, except that if the magnet plate **6***b* is not moved when a ball is thrown, electromagnets must be used and be disconnected during the bowling action.

The invention contemplates the use of various types of magnetic means in combination with frame means for movably positioning such magnetic means with relation to a bowling alley. Thus Figs. 7 and 8 show a construction wherein a bowling alley floor **1***c* at the pin receiving area thereof is provided with a plurality of slots **4***c* that extend completely therethrough. This bowling

alley floor 1c is provided with a removable top sheet or cover 40 which is removably engaged with the bowling alley floor 1c in any desired manner. As a feature of this particular construction, the floor 1c may be vertically adjustably positioned on a base 41 by any conventional adjustable means, such as turnbuckles 42, which engage threaded studs or screws 43 and 44 that in turn engage the bowling alley floor 1c and the base 41 with a plurality of such turnbuckles 42 being engaged with spaced or corner portions of the floor 1c to position it in the desired adjustable manner to align it exactly with the remainder of the bowling alley.

In this embodiment of the invention, a plurality of permanent magnets 5c of U-shape in design are suitably secured to a carrier board or member 6c in suitable spaced relation so that there will not be any undesirable leakage of flux between adjacent magnets. In this instance, magnetizable pole bars 45 and 46 are carried by and extend between similar poles provided on the magnets 5c. Fig. 8 shows that several pairs of magnets are placed side by side with each other in the apparatus, and the pole bars connecting to similar poles may be connected together by end pieces one of which is shown in 45a in Fig. 8.

In this embodiment of the invention, a pair of toggles 47 are associated with the carrier board 6c at each lateral margin thereof and are connected by connecting links 48 so that when an operating lever 49 is secured to one of such toggles 47, on each lateral margin of the apparatus, arcuate movement of the control lever 49, manually or by conventional automatic control means, such as a solenoid, will cause the carrier board 6c to move vertically in a desired manner. It will be realized that the pole bars 45 are adapted to extend into the slots 4c and, if desired, the cover 40 may have slots 40a provided therein and extending therethrough so that the ends of the pole bars 45 and 46 may protrude up therethrough and be flush with the operative surface of the bowling alley. However, it will be realized that this cover 40 may not have any slots therein in some instances and still have satisfactory functioning of the apparatus. The slots 4c may extend either longitudinally or transversely of the apparatus but slightly stronger holding actions appear to be secured when the pole bars are positioned to extend transversely of the bowling alley.

So as to retain the carrier board 6c in desired vertical relationship to the remainder of the apparatus, one may journal guide rolls 50 thereon, which guide rolls are adapted to engage the turnbuckles 42 or other guide means for controlling the longitudinal positioning of the carrier member 60 and the magnet means carried thereby with relation to the remainder of the alley.

It is thought that tapering the upper ends of the pole bars 45 and 46 as shown in Fig. 8, aids in concentrating the electro-magnetic strength provided by the natural magnets used in the apparatus of the invention. The spacing of the upper ends of the pole bars 45 and 46 and the slots 4c are for illustration only. The pin 51 must bridge over at least two magnet bars to obtain the desired holding action thereon.

In the specification, it will be realized that the expression "magnet means" includes any type of supplemental pole pieces such as provided in the embodiment of the invention shown in Figs. 7 and 8.

A magnetic wear plate 50 is shown on a pin 51 in Figs. 7 and 8. The wear plate may be made of metal or plastic with magnetizable particles therein, as desired.

The magnet means preferably when inoperatively positioned have opposite poles positioned closer to each other than to the floor surface.

It will be realized that the magnet means used in practice of the invention may be of any desired strength, size and number, and that sufficient strength can be provided to secure a bowling pin fixedly in place against any normal or approximately normal forces applied thereto in any sweeping or clean-up process in automatic pin setting means. The apparatus of the invention is relatively inexpensive and uncomplicated and is adapted to have a long service life with a minimum of maintenance thereon. It would not be difficult to provide desired holes or recesses in a bowling alley from the under surface thereof when the alley is being produced, or the end of the alley even could be opened up after the alley has been assembled to build in control and holding means in accordance with this invention. Thus it is contended that the objects of the invention have been achieved.

While several complete embodiments of the invention have been disclosed herein, it will be appreciated that modification of these particular embodiments of the invention may be resorted to without departing from the scope of the invention as defined in the appended claims.

We claim:

1. In a bowling alley having fixed floor means in the bowling and pin receiving areas thereof, a plurality of elongate permanent magnets, carrier means positioning said magnets in closely spaced association protruding upwardly from the positioning means over the entire pin receiving area of the bowling alley, toggle means positioning said carrier means for movement to move the upper ends of said magnets to and from immediately adjacent relation to the lower surfaces of the bowling alley, means for actuating said toggle means to move said carrier means and magnets into close association with the lower surfaces of the bowling alley, and means for guiding and controlling the movement of said carrier means.

2. In a bowling alley having floor means in the bowling and pin receiving areas thereof, a plurality of permanent magnets, carrier means positioning said magnets in closely spaced association protruding upwardly from such carrier means over the entire pin receiving area of the bowling alley, roller and guide means positioning said carrier means for movement in a direction normal to said floor means to move the upper ends of said magnets to and from immediately adjacent relation to the lower surfaces of the bowling alley, and means for moving said carrier means and magnets as a unit to and from close association with the lower surfaces of the bowling alley.

3. In combination, a base floor for the pin receiving area of a bowling alley, a top floor section removably carried and positioned by said base floor, rod and screw means adjustably positioning said base floor to move it vertically for alignment of said top floor with another portion of a bowling alley, said base floor having apertures therein, a plurality of magnet means having poles shaped to be received in said apertures, and means for moving said magnet means as a unit to insert and remove said poles into and from said apertures to exert a variable magnetic force on pins on the bowling alley.

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