Sept. 16, 1969 W. R. KING 3,467,010

PRINTING WHEEL WITH YIELDABLE SURFACE

Filed March 23, 1966 3 Sheets-Sheet 1

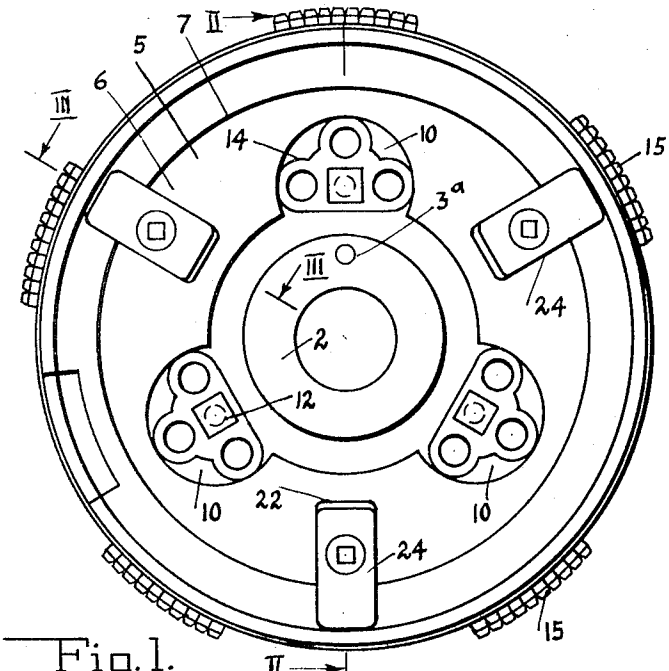


Fig. 1.

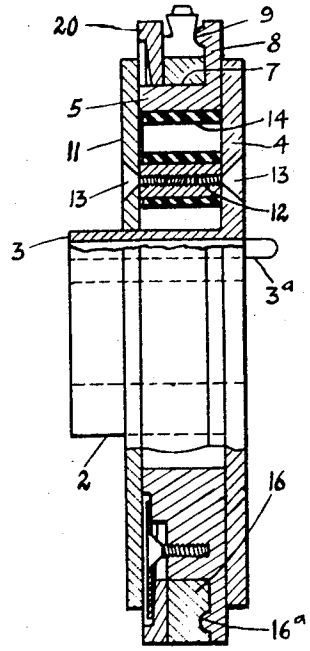


Fig. 2.

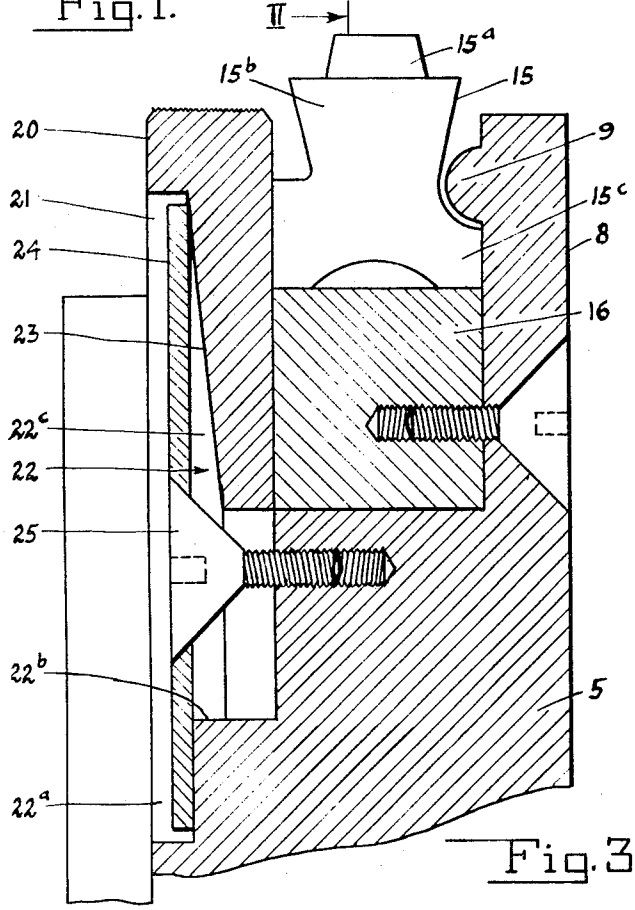


Fig. 3.

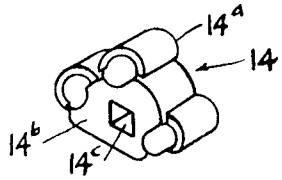


Fig. 8.

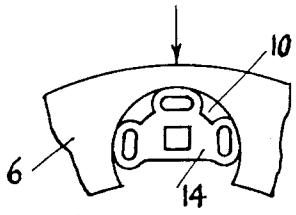


Fig. 9.

INVENTOR.
WILLIAM R. KING.

BY
Christy, Parmelee & Strickland
ATTORNEYS.

Sept. 16, 1969 W. R. KING 3,467,010

PRINTING WHEEL WITH YIELDABLE SURFACE

Filed March 23, 1966 3 Sheets-Sheet 2

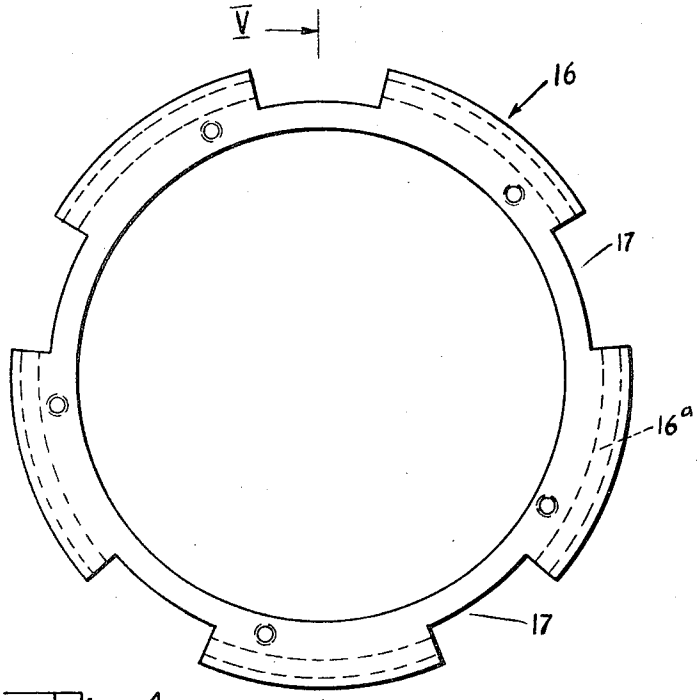


Fig. 4.

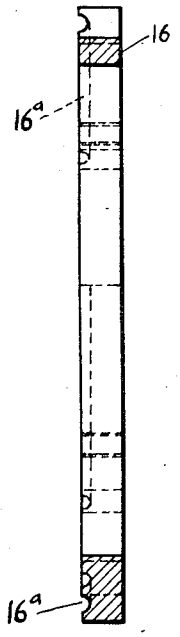


Fig. 5.

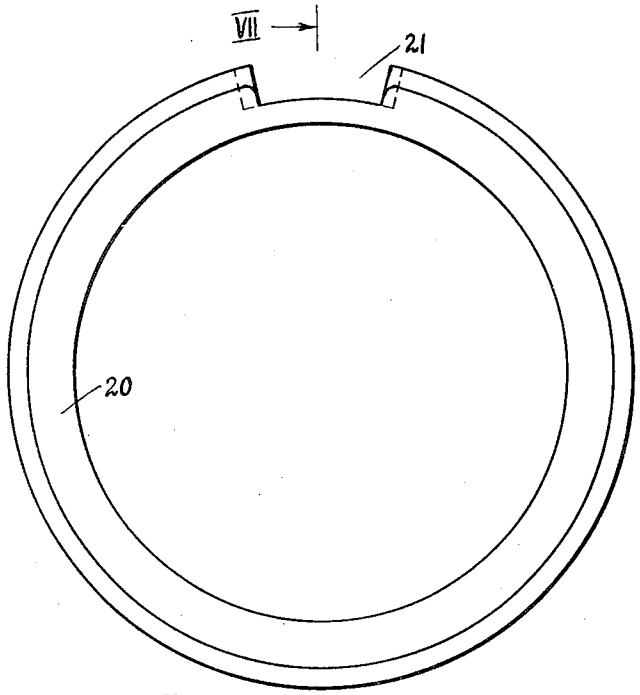


Fig. 6.

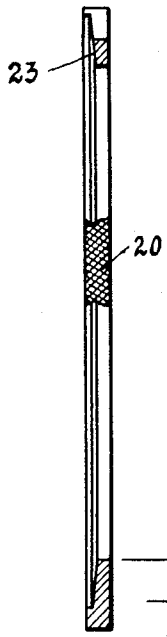


Fig. 7.

INVENTOR.
WILLIAM R. KING.

BY
Christy, Parmelee & Strickland

ATTORNEYS.

Sept. 16, 1969 W. R. KING 3,467,010

PRINTING WHEEL WITH YIELDABLE SURFACE

Filed March 23, 1966 3 Sheets-Sheet 3

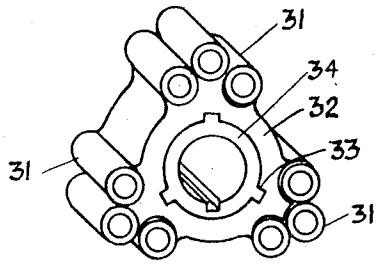


Fig. 10.

INVENTOR
WILLIAM R. KING.

BY
Christy, Parmelee & Strickland

ATTORNEYS.

United States Patent Office 3,467,010 Patented Sept. 16, 1969

3,467,010

PRINTING WHEEL WITH YIELDABLE SURFACE

William R. King, Wilkinsburg, Pa., assignor to Jas. H. Matthews & Co., Pittsburgh, Pa., a corporation of Pennsylvania

Filed Mar. 23, 1966, Ser. No. 536,704
Int. Cl. B41f 13/10, 27/06
U.S. Cl. 101—376 8 Claims

ABSTRACT OF THE DISCLOSURE

There is disclosed a printing wheel having separate hub and rim members with type-holding means on the periphery of the rim. The rim has a plurality of circularly-curved cavities thereabout in each of which is a cushioning element of rubber that makes line contact with the cavity walls at three separate points to be equally yieldable in radial and angular directions. Torque is transmitted from the hub to the rim through these cushioning elements.

This invention is for an improvement in printing wheels of the type most generally, but not exclusively, used industrially for imprinting a date, code number or other identifying indicia on individual pieces of merchandise or containers.

One area of industrial marking to which the invention has particular utility is the imprinting of a code on the closures of glass containers after the containers have been filled and the caps applied thereto, and reference will be made herein to such operations only by way of illustration and without limitation as to many other operations where the invention has utility.

Since glass containers in the operation above referred to are made within certain tolerances, such containers are not of strictly uniform height and some will be taller than others. If they are carried on a conveyor belt in regular spaced relation under a marking wheel having rubber type, and the wheel is set at a height to make a clear imprint on a container of minimum height, the rubber type is compressed by taller containers, distorting the type and smudging the imprint, and this is worsened when the printing wheel is geared to the conveyor because when the type is decreased radially by contact with a higher container, while the rotational speed is constant, the angular velocity of the type moving on a shorter radius is decreased relative to the linear speed of travel of the container.

Attempts heretofore made to cure this defect by mounting the type in radially-yieldable segments on the printing wheel cannot eliminate this difficulty.

According to the present invention there is provided a printing wheel with separate hub and rim members with yieldable means operatively interposed between the two in such manner as to compress both radially and angularly and thereby permit movement of the entire rim relative to the hub between concentric and eccentric positions. The type is carried on the periphery of the rim member. When such a wheel is mounted on the shaft of a marking machine and set to imprint clearly on the cap of a container of minimum height, a container which is taller will, as it moves under the marking wheel, push the rim up and out of concentricity with the hub. If it be assumed that the printing wheel is being rotated at a rim speed equal to the linear speed of travel of the containers under the marking wheel, say, merely for illustration, a peripheral speed of fifteen inches per second, this peripheral speed will nevertheless be constant around the entire rim. Any variation in container height may be compensated for without flattening

or compressing the type or varying its peripheral speed relatively to the linear speed of container.

The invention further contemplates a unique arrangement of a wheel so constructed with a mortise ring and mortise locking ring to facilitate the changing of type in the wheel.

The invention may be more fully understood by reference to the accompanying drawings in which:

FIG. 1 is a front elevation of a type wheel embodying my invention with one side plate thereof removed;

FIG. 2 is a transverse vertical section in the plane of line II—II of FIG. 1;

FIG. 3 is a fragmentary enlarged transverse section in approximately the plane of line III—III of FIG. 1;

FIG. 4 is a front elevation of the type holding ring herein sometimes referred to as a "mortise ring";

FIG. 5 is a transverse section through the mortise ring in the plane of line V—V of FIG. 4;

FIG. 6 is a front elevation of the locking ring removed from the assembly;

FIG. 7 is a view partly in side elevation and partly in transverse vertical section of the locking ring shown in FIG. 6, the parts in section being in the plane of line VII—VII of FIG. 6;

FIG. 8 is a perspective view of one of the cushion elements removed from the assembly;

FIG. 9 is a fragmentary schematic view of a portion of the floating rim member and one of the cushion elements illustrating the deflection of the cushion element under pressure in the direction of the arrow; and

FIG. 10 is a perspective view of a modification showing several of the cushion elements joined together into a single unit for mounting on the drive shaft.

In the drawings, the numeral **2** designates generally a hub member having a hollow sleeve portion **3** and a flange **4**. The hub member is designed to be keyed or otherwise fixed on a shaft (not shown), the shaft being a part of a marking machine of a known construction. In the drawing a drive pin **3***a* is shown for cooperation with driving means on the shaft.

There is a rim member **5** separate from the hub member having a web portion **6**, a periphery **7**, and a peripheral flange **8**. On the inner face of the flange **8** there is an annular bead **9**. The web portion **6** is provided with a plurality of cavities **10** therein equidistantly spaced from one another. There are preferably an odd number of these cavities, three of them being shown, but more may be found desirable, depending on the size of the wheel and the number of type-receiving mortises as hereinafter described provided on the wheel. While there could be four, five would be preferable, and there may be more. By having an odd number, no two of them are diametrically opposed, and this is desirable. Each cavity is partly circular and desirably more than 180° in extent, but less than 360°, 210° of arc or so being preferable.

There is a removable side plate **11** on the hub spaced from the flange **4** and of approximately the same overall diameter. The removable flange plate is attached to and held in spaced relation to the flange on the hub by spacers in the form of cross members **12** of non-circular cross-section held in place by opposed screws **13** threaded into the spacers. The spacers are so positioned that one of them is centered on the axis of each of the cavities **10**.

The rim member is resiliently held in concentric relation to the hub member by cushion elements **14** fixed on the spacers **12** contacting the walls of the cavities in which they are located. These cushion elements, as best seen in FIG. 8, comprise three cylindrical portions **14***a* with th axis of the center one 90° from the axes of the other two. The cylindrical portions are joined by a connecting

structure **14***b* with a non-circular opening **14***c* centered equidistantly from each cylinder. A spacer **12** passes through the opening **14***c* of each of these cushion elements whereby the cushion elements are held against rotation about their respective spacers. The three cylindrical portions **14***a* of each cushion element make contact with the wall of the circularly-curved cavity in which the element is received with the center cylindrical portion **14***a* of each cushion being normally radially positioned with respect to the center of the hub.

The cylindrical portions **14***a* preferably have axial openings therethrough, like a cluster of three tubes joined together. The elements are formed of a resilient material, preferably a rubberous material, such as natural or synthetic rubber or rubber-like plastic, or they could be constructed with the cylinders being of resilient metal. The resilience of yield may be varied according to the size, speed and other factors entering into the construction or use of the wheel. For example, using a given material, the cushion may be made softer or firmer merely by making the cylinder wall thinner or thicker. In FIG. 1 it will be seen that there are three of these cushion elements, since there are three cavities **10**, and each cushion element is spaced from the exterior of the sleeve portion **3** of the separate hub member.

The type, designated **15**, is carried on the periphery of the rim and projects slightly beyond the flange **8**. It may be secured to the rim in various ways, but I prefer a construction like the one shown in the drawings. According to this arrangement, a ring **16**, which I term a "mortise ring," is fitted about the periphery **7** of the wheel rim. At one or more locations, it has type-receiving recesses or mortises **17** therein (see FIG. 4). In the particular construction here shown the mortise ring has five such mortises, and the ring is of minimum radial thickness at these places, whereas between the mortises the ring has a radial thickness equal to the height of the peripheral flange **8** of the rim. Where the mortises are located, the bead **9** on the flange **8** is exposed, but between the mortises, the mortise ring is groved at **16***a* to interfit with this bead so as to fit flush against the inner face of flange **8** (see FIGS. 2 and 5).

There is a locking ring **20** on the rim at the side of the mortise ring opposite the flange **8**. This ring has a knurled periphery so that it may be rotated on the wheel rim, and has a peripheral notch **21** of a length preferably about equal to the length of type holding recesses or mortises in the mortise ring. It may be rotated to a position where the notch in the locking ring is alongside or registers with a type holding recess to enable the type in the recess to be removed and other type inserted. After a change of type the ring is rotated to a position where the notch is out of register with any of the type-receiving recesses in the mortise ring.

The locking ring **20** is held in position on the rim against the side of mortise ring **16** and frictionally held against free or accidental rotation by resilient retaining means. As here shown, the web of the rim member of the wheel has a plurality of recesses **22** therein which are located between the cavities **10**. Each recess **22** has a shallow part **22***a* at the end which is closer to the center of the wheel with a step **22***b* between the shallow portion **22***a* and deeper portion **22***c* that extends to the periphery of the rim member (see FIG. 3). The outer face of the locking ring **20** is beveled to form a bevel **23** that slopes toward the portion **22***c* of the recess. In each recess there is a leaf spring **24** having the inner end received in the shallower portion **22***a* of the recess and its outer end engaging the beveled surface **23**. A screw **25** passing through the leaf spring intermediate its ends flexes the spring to provide a resilient pressure against the locking ring, thereby frictionally holding it against free rotation.

The type **15** itself may comprise separate units formed of rubber, each with an indicia imprinting portion **15***a* on its outer end, a shank portion **15***b* of decreasing width toward the base, and a base portion **15***c*. The base, which is concave on the inner surfaces, sets on the mortise ring, and the bead **9** extends over the base at one side and contacts the shank, while the opposite side face of the base is confined against the locking ring. Held in this manner, the type elements cannot tilt sideways and they cannot be removed radially, even when the wheel is rotating at high speed. By rotation of the locking ring on the rim, type may be removed and replaced without removing the wheel from the machine in which it is used.

Assuming that the wheel is located over a conveyor along which regularly-spaced filled containers are moving, with the wheel being set to imprint a code marking on each one in succession as it moves beneath the wheel, the wheel is so adjusted that it will make a clear imprint on the top of a container of minimum height, and with the rim and hub concentric. If a container of greater height is encountered, the rim which is in floating relation to the hub, will be pushed up by contact with the container, and there will be no change in its peripheral speed relative to the linear travel of the container. Whether the wheel is driven by a drive connected to the conveyor or by a separate drive, or is rotated by contact with the work, the type always is moving on a circle of constant diameter and, in effect, the hub changes its relation to the center of this circle. This action of the cushioning elements insures clear printing and smudging of the printing is avoided.

It will be noted from FIG. 9 that when one of the three cylinders in the three-cluster cushion is deformed in a direction radial to the wheel, equal and opposite angular components of pressure are exerted on the remaining two cushion elements so that the angular relation of the rim to the hub does not change when the rim shifts from a concentric to an eccentric position relative to the hub. Resilience is achieved less by compression of the substance of which the cushion is formed than by distortion of the cylindrical elements of the cushions and their inherent elasticity which causes them to return to their original shape.

While the cushion elements as heretofore described comprise isolated clusters of at least three cylindrical portions each, with each cushion element mounted on a separate post, FIG. 10 shows a modification in which a plurality of cushion elements are integrated and keyed to the sleeve of the hub member assembly, the remainder of the wheel being similar to that previously described.

In FIG. 10, each of the clusters of three distortable cylindrical elements is designated **31**, and these clusters are integrally molded on a supporting body **32** that fits on the hub **34** and is held against rotation on the hub by keys **33**. With this arrangements as with the cushion clusters previously described, each cluster of cylindrical elements is received in a circularly-curve dopening in the body of the floating rim. This arrangement eliminates the necessity for spacers **12** as previously described.

In the forms particularly shown in FIGS. 1 and 2 and in FIG. 10, the type is carried on a floating rim normally held in concentric relation to the hub by cushion elements arranged to flex radially and angularly when a predetermined pressure is applied to one point on the rim. The several cushion elements and the cavities in which they are received are so contoured that there are line contacts between the cushion elements and the walls of the cavity in which they are received at a plurality of angularly-separated locations so arranged that when one of the yieldable elements compresses radially, all of the others are subjected to angular components of pressure which oppose each other to hold the floating rim against angular rotation relative to the hub, so that the surface of the type will not smudge the printing. The arrangement of spaced lines of contact between the cushion elements and the cavities in which they are received enables the rim to tilt out of a plane perpendicular to the axis of the hub where some contour of the surface being printed upon requires

such angular adaptation of the type-carrying periphery of the wheel.

While I have described the invention as being adapted to marking on the lids of filled containers, the marking wheel may be used in many environments where irregular surfaces or pieces are encountered, as will be readily appreciated by those skilled in the art.

I claim:

1. A printing wheel comprising a hub member, a floating rim member, the rim member having a peripheral flange and having a web portion with a plurality of circularly-curved openings therethrough of more than 180° curvature, each opening forming a cavity in the rim member, a cushion element concentrically positioned in each cavity fixed to the hub member and having a cluster of at least three parallel cylinder portions thereon with one such portion positioned 90° from the other two, all of the cylinder portions contacting the circularly-curved walls of said openings, and means cooperating with the peripheral flange on the floating rim member for holding type elements in printing position at the rim of the wheel.

2. A printing wheel comprising:

(a) a hub member,

(b) a separate rim member,

(c) means on the rim member for holding type elements, and

(d) cushion elements operatively interposed between the hub member and rim member yieldingly retaining the rim member in concentric relation to the hub member and fixed thereto against relative movement, said cushion elements having three parallel connected cylinder portions, one of which has its axis at about 90° to the axes of the other two and with a connecting portion non-rotatably secured to one of said wheel members, said other wheel member having a plurality of circularly-curved cavities therein concentric about the center of the wheel in which said three cylindrically-curved portions are fitted.

3. A printing wheel as defined in claim 2 in which the cylindrical portions are of rubberous material.

4. A printing wheel as defined in claim 2 in which said cushion elements are formed of a rubberous material and said cylindrical portions are tube-like with deformable resilient walls.

5. A printing wheel as defined in claim 2 in which the hub member has cylinder portion and a flange portion and a separate disk, and the rim member is confined between the flange portion and disk, the rim member having a peripheral flange at one side thereof with a type-engaging bead thereon, said type-holding means comprising a mortise ring fitted on the rim member having at least one type-holding recess in its periphery, a locking ring on the rim opposite the flange with the mortise ring between the flange and the locking ring, said locking ring being adjustable about the rim and having a notch therein which may be moved into and out of register with the type-holding recess in the mortise ring, the type in the recess of the mortise ring being confined by the bead on the flange of the rim and the locking ring, and means for restraining the locking ring against free rotation.

6. A printing wheel comprising:

(a) a hub member,

(b) a separate rim member,

(c) means on the rim member for holding type elements thereon,

(d) said rim member having a concentric series of cavities therein comprising an odd number of equally-spaced openings extending in the direction of the axis of the wheel, each opening being of circular contour of more than 180° curvature, and

(e) a resilient cushion positioned in each cavity and fixed on the hub member to transmit torque from the hub member to the rim member, each cushion member comprising an integral cluster of at least three parallel cylindrically-curved portions at is periphery for making line contact with the cavity walls, one such cylindrical portion being spaced 90° from the other two.

7. A printing wheel as defined in claim 6 wherein the center of the cluster is at the center of curvature of said cylindrical cavities.

8. A printing wheel as defined in claim 6 wherein each cushion member has a non-circular opening therethrough with the three cylindrical portions being concentric about the center of said opening, the hub member having a non-circular post thereon extending in a direction axially of the wheel into each cavity and fitted into the opening of said cushion member.

References Cited

UNITED STATES PATENTS

1,446,393	2/1923	Peny	152—43
2,085,323	6/1937	Leash	101—376
2,475,524	7/1949	Scott et al.	101—376
2,548,839	4/1951	Coombes	101—376 XR
2,715,024	8/1955	Nydegger et al.	101—376
2,949,079	8/1960	Beattie	101—376
2,483,422	10/1949	Larson	29—126

FOREIGN PATENTS

151,576	5/1953	Australia.

ROBERT E. PULFREY, Primary Examiner

J. R. FISHER, Assistant Examiner

U.S. Cl. X.R.

101—377